A Database Publication

# THE MICRO USER

Volume 7
Number 1
March 1989
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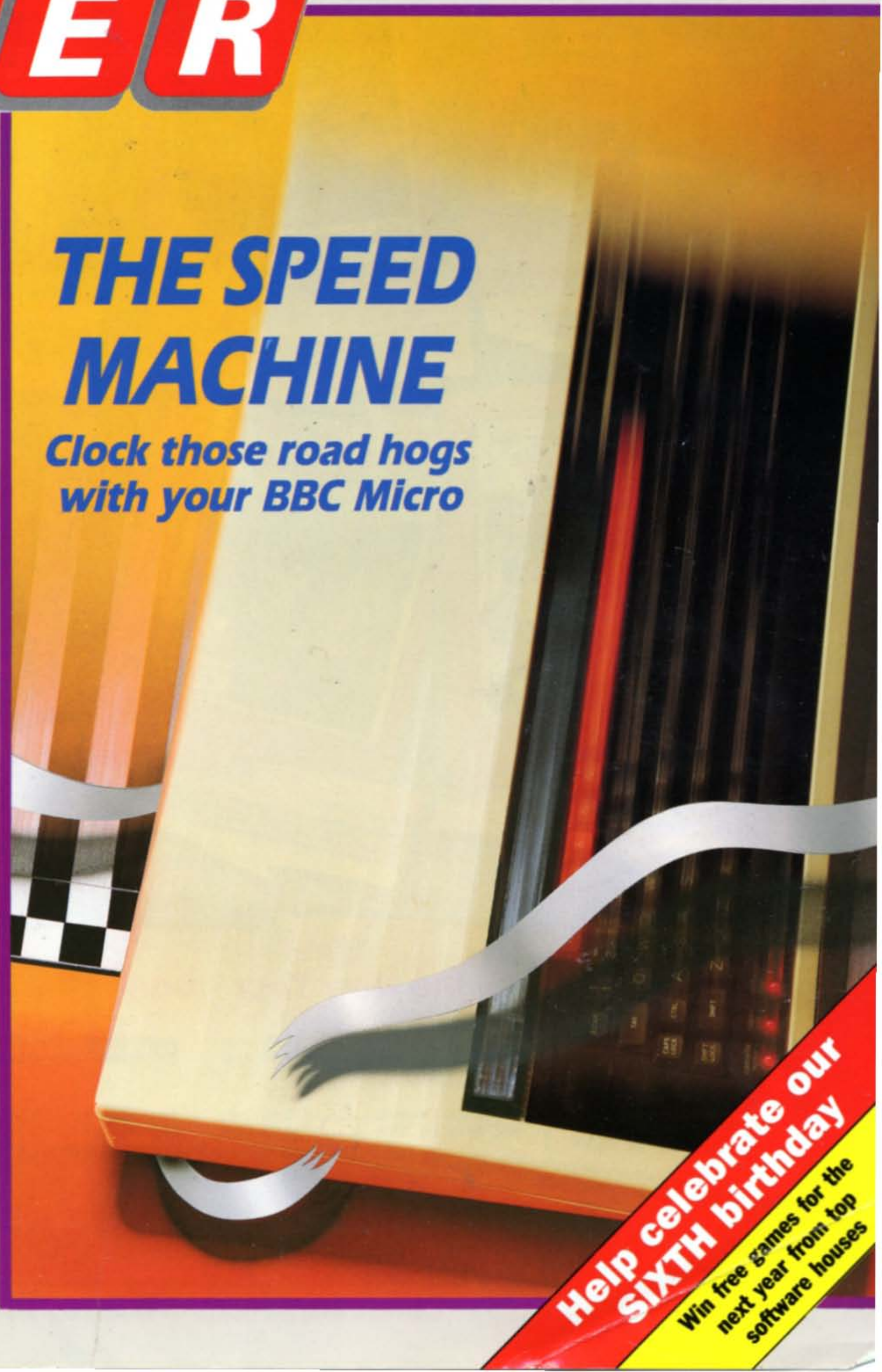

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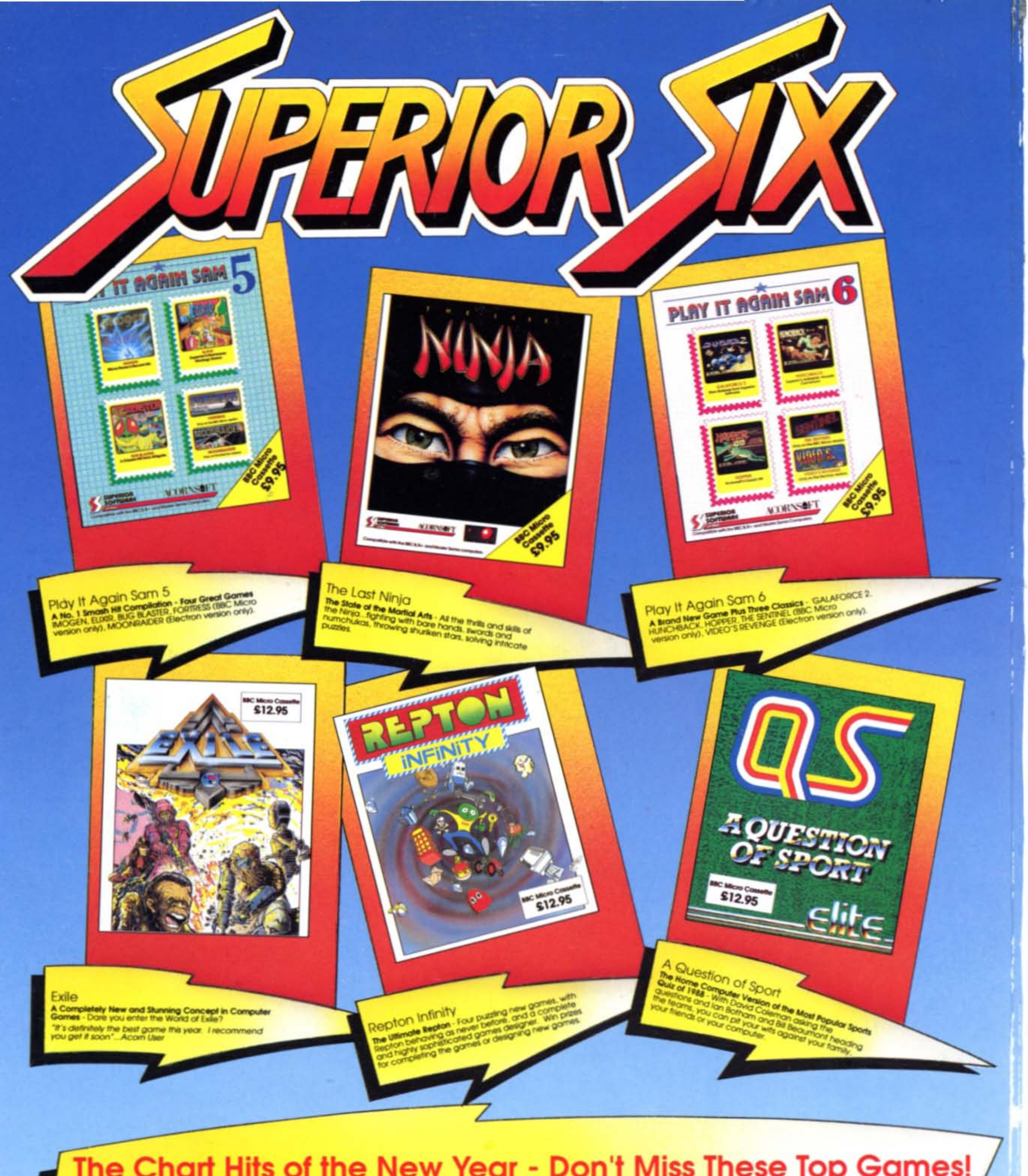
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The Micro User welcomes program listings and articles for publication. Material should be typed or computer-printed, and preferably double-spaced. Program listings should be accompanied by cassette tape or disc. Please enclose a stamped, self-addressed envelope, otherwise the return of material cannot be guaranteed. Contributions accepted for publication will be on an all-rights basis.

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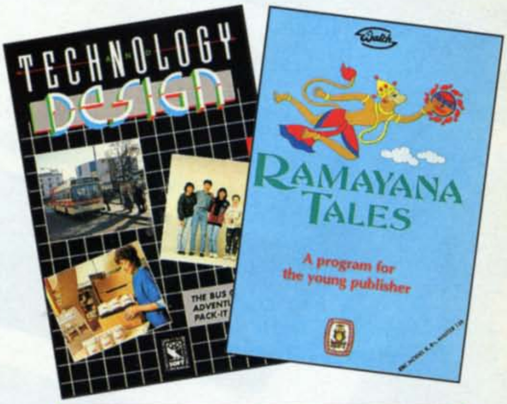

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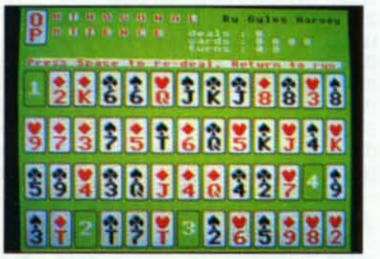

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**Want to find out how fast a car is going or the speed of a snail? Our handy utility for either the BBC Micro or Z88 can help you. Whether you're making a scientific study or lobbying your MP about traffic problems, you can give your facts micro-accuracy. Just turn to Page 21.**

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## MICRO USER CLASSIFIEDS

The best bargains in the world of the BBC Micro come from fellow readers of *The Micro User*. Turn to **Page 136** to find just what you're looking for – from cheap modems to complete computer systems.

✓ **For full details of how to use the Checksums, see the article on Page 48 of the February 1989 issue of *The Micro User*.**

✱ **The Type-it-in symbol indicates that the feature contains at least one full length listing for you to key in on your micro.**

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# NEWS beat

## Euro market printers safe, says distributor

Malcolm Jamieson . . . "They're not dangerous"

A WARNING from a major manufacturer that "grey imports" of two of its most popular printers may be unsafe has been dismissed as scaremongering both by a leading distributor involved and a technical expert.

The models in question are the Star LC-10 and LC-10C, both extensively used with BBC Micros in schools and colleges.

Star Micronics UK recently warned its dealers to be on the look out for printers designed for the European market, but brought into the UK instead.

Although almost identical, these machines differ in being fitted with 220 volt power supply with a 10 per cent plus or minus variant instead of the UK 240 volt.

"Safety is the main concern that worries me", said Roger Bayley of Star. "These grey imported printers will run hot, and there is the faintest chance of of one of them catching fire in the event of a power surge. This would do untold damage to our reputation".

While stressing that the practice of unofficial import and sale of Star printers is not illegal, Bayley has suggested that anyone with a grey import should return it.

However Bayley's comments were dismissed as sour grapes by a leading unofficial distributor. "What is really behind this is that we are able to sell these machines at much lower prices than Star's official dealers", said Malcolm Jamieson, the managing director of Crown Computer Products of Burscough, Lancashire.

"Our company imports the NX1000, the European badged version of the LC10. And we have sold these extensively, not only to the man in the street but also to schools and colleges through our newly-formed education division.

"We are quite confident that the machines run perfectly well on UK voltage and in no way could be considered dangerous.

"All our units carry a full English manual and instructions together with a full 12 month return to base warranty. Naturally the consumer should beware of anything less than this being offered as it may suggest they are converted machines".

The Crown boss also hit out at the term grey imports. "This is a phrase that has been coined to cast doubts on what are really legitimate direct importers", he said.

Consulted on the safety aspect of the direct imports, Mike Cook, technical editor of *The Micro User* and senior lecturer in physics at Manchester Polytechnic, came down heavily on the side of Crown.

"I'd eat my hat if there was any cause for concern because a printer had a 220 volt power supply as opposed to 240 volt", he said. "It simply doesn't make a scrap of difference – to safety or anything else".

## Technomatic expands

*COMPUTER systems and peripherals supplier, Technomatic Limited, has moved to new larger premises in Church Lane, Kingsbury, London NW9.*

*The new building, Techno House comprises 10,000 sq ft with ample car parking available. Besides better warehousing and office facilities, Technomatic now has a large computer demonstration area for customers.*

*The move to Kingsbury from Dollis Hill is due to the company's continued expansion. Said Director Jay Mehta: "We simply outgrew our previous location.*

*"We are extremely pleased with the new offices and I am confident that we will be able to offer an even better service to our customers".*

## W.H. Smith goes for

THE MICRO USER

**FROM Glasgow to Gloucester and Bournemouth to Blackpool, *The Micro User* is featuring in a national promotion at 140 branches of W.H.Smith.**

**It has been selected from 20 leading computer magazines to underline the quality and depth of the retail giant's stock of titles.**

**For three weeks up to March 6 the cover of this issue is on show in special window displays at the cream of the group's High Street stores – its "three window" branches.**

**"We chose *The Micro User* because it is one of our top selling magazines and we felt it was the best title to promote our range of computer publications to the public", said retail news buyer for W.H.Smith, Nigel Perris. "We are delighted to feature it in our windows".**

## Take a Risc

SYSTEM DeltaPlus from Minerva Software (0392 437756) will now operate with the Acorn Risc OS. It has been upgraded and is supplied with a re-written manual. Price £79.95.

The Risc OS upgrade itself contains a utility which will make existing Minerva business software run correctly.

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# NEWS*beat*

## A real fun day for Theresa

MUSCULAR
DYSTROPHY

*THERESA Elliot has cancelled plans to buy a home computer for her daughters after a New Year stroke of luck.*

*The housewife from Honour Oak Park, London, was presented with an Archimedes after scooping first prize in a Great Monument Grand Draw organised by the Muscular Dystrophy Group and supported by Acorn Computers.*

*Research into muscular dystrophy will be funded by money from the draw which was held as part of a Great Monument Fun Day. A total of £20,000 was raised by the event which started at the Houses of Parliament and took in 14 monuments and well known buildings in London ending at The Burgers of Calais on the Embankment. Over 1,600 children from 21 schools took part.*

*Theresa was presented with her prize in front of The Monument in London before a reception at Bill Bentley's Monument Restaurant.*

*With Theresa in our picture is Vikki Lawrence (left), from the Muscular Dystrophy Group, and Jane McAteer representing Acorn.*

## New vocational software

VEHICLE repairs, horticulture, catering and hairdressing are some of the jobs covered in a new set of vocational software packages for the BBC Micro from Computer Training Services (021-233 3465).

Computers? No Problem! is the name of the series designed for first time users to build confidence both in personal and computer skills.

Material is presented in an easy-to-understand format using cartoons and humour to illustrate points. Software pack £113.82 (including postage and packing). Back-up manuals £28.45.

## Six years on – and still going strong

BBC MICRO USER
THE MICRO USER
RUSSIAN FOR BEGINNERS
FREE!

"THE independent magazine that helps you make the most of your micro". That was the claim for *The Micro User* when it was launched in March 1983 and it still holds good six years on.

Turning back the pages in this sixth birthday edition, our first issue broke the news that sales of the BBC Micro had reached 11,000. Acorn was looking forward to going into Europe and planned an aggressive drive into the education market in America.

Later that year, *The Micro User* told readers of Acorn's new micro, the Electron, due out in June. It was hoped to sell 50,000 by Christmas.

**August, 1983** brought news of the first Micro User Show in Manchester. It attracted 12,500 visitors and there were plans to take it round the country.

Our first birthday issue hit a high note with the BBC Micro taking the US market by storm. More that $50 million worth of business had been done there in the previous six months.

In **1984**, we reported a critical shortage of chips facing manufacturers of BBC Micro add-ons who were being forced to pay double the normal price.

Acorn won the Queen's Award for Technological Achievement and the Queen saw inside a BBC Micro when she opened Cambridge Information Technology Centre.

Sir Clive Sinclair claimed that his QL would topple the BBC Micro from its top spot in education, and Acorn was poised to sell into Russia.

The second birthday issue dropped the first hints of a new enhanced model of the BBC Micro, and in a special birthday competition we offered a gold plated model.

Olivetti acquired 49.3 per cent of Acorn as part of an £18m rescue package and after losing £6 million at its previous attempt, Acorn was poised for a second trading assault on the USA.

In **July, 1985,** *The Micro User* broke the news of secret talks on an upgrade kit to convert the BBC Micro into B Plus.

The following month, this model went on the market priced at £499.

Mid 1985, electronic grafitti was a problem for micro users logging on to bulletin boards and in September Acorn unveiled its 32 bit workstation – the Acorn Cambridge – rapidly followed by a 128k version of the BBC B Plus.

By **March 1986**, sales of the Master series had exceeded

# MATHS EXAM?

## *Watch your BBC micro give you the answers — step by step!*

### *MASTER MATHS*

*Mastering mathematics has just become very, very, easy. Clear, lucid solutions to any problem — complete with all the working out.*

*Just imagine some of the benefits:-*

***UNDERSTAND** - the bits the teacher didn't explain.*
***HOMEWORK** - Check your work - get better marks*
***REVISION** - Solve questions from past papers*
***Check it out — before somebody decides to ban it.***

### STEP BY STEP

Your BBC will give you not just the answer, but the complete, detailed, **step by step** working out.

Every single step is also explained with words, so you will **understand** just what is going on.

You will see your own, particular problem, turned into a **worked example** by the computer.

And when time is strictly limited, you won't waste hours banging your head against a brick wall.

### G.C.S.E. and ages 11-16

Covers all the topics in GCSE algebra, for levels 1, 2 & 3:-

- Solves Quadratic Equations, eg $3x^2-5x-2=0$
  Simultaneous Equations, eg $\left[\begin{array}{l}2x+y=8\\ 2x^2-4y-10=0\end{array}\right.$
  Inequalities, eg $10x+7>2(x-3)$
  Linear Equations, eg $5x+4=0$
- Finds the Value of Formulae by the Method of Substitution, eg Find $5x^3-(4x+5)$ When $x=-3$
- Changing the Subject of Equations, ● Common Factors, ● Factorizing Quadratics, ● Simplifying, ● The Laws of Indices, ● Algebraic Fractions and Cancelling, ● Expanding and Multiplying Brackets, ● The Difference of Two Squares,
- Step by Step Evaualation using the BODMAS Rule,
- Function Theory: Domain, Inverse, Range, Composite Functions, ● Wide choice of Variables (x,y,z,...).
- Draws Graphs of equations and formula's

### TEST YOURSELF

Reinforce your new understanding. Could you reproduce it in an exam?

- Having solved the problem, you may if you wish, let the computer test you.
- This time **you** try to solve the problem, and your BBC **intelligently** monitors your progress, making helpful suggestions if necessary.

### NATURAL PRESENTATION

The Advanced Editor displays mathematical expressions and equations in a pleasing and natural manner, just as on a blackboard or in a good text book.

- Shows indices as small characters,
- Uses 'top and bottom' quotients,
- Automatic checking for mistakes with brackets and other common errors,
- Uses normal algebraic shorthand (eg. 5abc instead of 5*a*b*c),
- Very easy to use.

### A LEVEL and AS LEVEL

Covers fundamental and advanced work in Differentiation and indefinite integration.

It particularly covers the **key areas** of

- Differentiation and Integration of Polynomials,
- Differentiation by the Product Rule and Quotient Rule,
- Differentiation by the Chain Rule, ● Differentiation of Logarithms and Exponentials, ● Integration by Parts,
- Integration by Substitutions, ● Integration of Powers of SIN and COS

Plus differentiation and integration of all the usual 'Standard Forms'.

**Problems can be as complex as you wish,** and you can build them up from

- A wide range of variables (x,y,z,...) ● The 'exponential' constant e, ● Any of the following functions:-

| | | | | | |
|---|---|---|---|---|---|
| SIN | COS | TAN | SEC | COSEC | COT |
| SINH | COSH | TANH | SECH | COSECH | COTH |
| ARCSIN | ARCCOS | ARCTAN | ARCSEC | ARCCOSEC | ARCCOT |
| ARCSINH | ARCCOSH | ARCTANH | ARCSECH | ARCCOSECH | ARCCOTH |
| LN | | | | | |

For example, a standard problem might be to differentiate SIN(COS(6ax+1)), or, harder, to integrate ARCTAN(x).

Just like a human expert, if one technique doesn't solve the problem, then alternative methods will be tried, and the software makes effective, intelligent choices.

Shows how to utilise principles from algebra and trigonometry, such as Reciprocals, the rules of Indices, the laws of Logarithms and various identities.

### TEACHER SUPPORT DISK

This enables the teacher or lecturer to build up a library of pre set problems.

Best of all, the student can immediately test himself or herself against any problem selected.

### DID YOU KNOW

Italian Renaissance mathematicians, a notorious bunch of crooks and cheats, held public algebra duels for gold and prestige. The most famous of these led to the solution of the cubic equation.

### EXAM SUCCESS TODAY

Please send me, AS QUICKLY AS POSSIBLE, the software indicated below. I enclose a cheque or postal order made payable to Maths Workshop.

NAME ..........................................................
ADDRESS ..........................................................
..........................................................
..........................................................

**For GCSE**
Symbolic Algebra
(includes Advanced Editor and
Test Yourself Facility) (£19.95) 40T 80T
Teacher Support Disc (£14.95) 40T 80T
**For A LEVEL and AS LEVEL**
Symbolic Calculus
(includes Standard Editor) (£16.95) 40T 80T

My Computer is a BBC B ☐ BBC B+ ☐ BBC Master 128 ☐

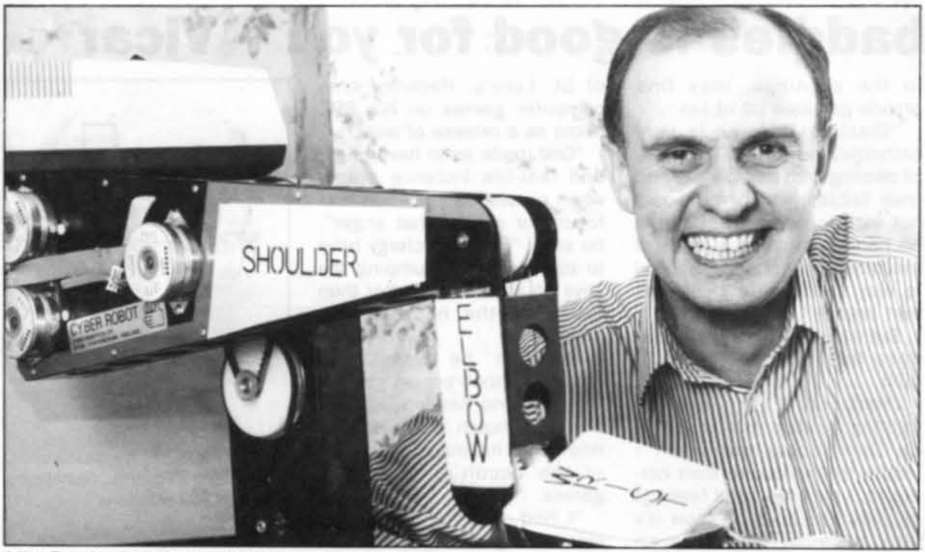
If you have any queries or would just like some advice, ring us on 0909 500599

OUTSIDE EUROPE: include the full price, and add an extra £4.00

NETWORKS: Our software is not suitable for networks.

***Please post today:***
**MATHS WORKSHOP, DEPT MU, 95 SOUTH AVENUE, WORKSOP, NOTTS. S80 2RE**

# NEWS beat



*Mike Topping and his winning entry*

# Success follows Innovation Award

POLIO victim Mike Topping's success in *The Micro User* 1988 Innovation Awards has brought him £30,000, a full time job and the chance to achieve a life's ambition.

Mike's winning entry was a robotic feeding arm which works with the help of a BBC B or Master. As a result of the competition, it will now become a workable reality and could be used by 11,000 disabled adults throughout the country plus children in special schools and the elderly in hospital.

GEC Control Systems of Kidsgrove has given Mike £15,000 worth of technological assistance by producing a prototype "black box" which will enable his device to be used by the severely disabled – even those without limbs.

After the Innovation Awards success, National Westminster Bank and the New Moorgate Charitable Trust in London have each donated £5,000.

When Kevin Perryman, editor of Munich-based magazine Spotlight, saw the robotic arm at the Electron & BBC Micro User Show he was so impressed that he made a collection in his office and sent Mike £500 plus the promise of a feature in his publication.

JCB Diggers of Uttoxeter has given £1,000 and a further £500 has come in from Brownie packs, churches and other organisations in Mike's home town of Newcastle, Staffordshire.

Success in the awards has brought personal rewards for 40 year-old Mike. "Since I graduated from Keele University last May, I had been doing unpaid work for CASE, Computer Applications for Special Education", he said.

"I won the competition on Sunday and went to see the Vice Chancellor on Monday. He was really very pleased with the result and offered me a paid job as a research fellow. The competition did that for me".

From Page 9

target by 30 per cent but there were stories of bogus BBC B Plus machines being sold in a nationwide swindle.

Headmasters in 90 schools were warned about copying protected software programs on classroom micros in May 1986 and by August that year there were the first rumours of a new super-powered 32 bit machine from Acorn.

After two years of financial problems, Acorn was reported back in the black with a £298,000 operating profit for the first six months of that financial year.

A technical breakthrough by Watford Electronics opened up IBM PC compatibility for the BBC Micro with its Co-Pro Adaptor and rumours on a new 32 bit machine grew.

The rumours bore fruit in **August 1987** when the Archimedes was unveiled. Hailed as the world's fastest micro, its target was six figure sales in the first year.

But November brought a setback in Acorn's finances with a loss of £1.38 million.

*The Micro User's* fifth birthday issue included news of a coup for Acorn to install 40 Masters and 128 BBC Micros in Japan's Ministry of Foreign Affairs.

New boss Harvey Coleman was formulating his plans to take the company forward into the 1990s.

## Cut price Arc plan denied

ACORN has discounted rumours that a new low cost Archimedes is in the pipeline.

Michael Page, the company's communications manager, told *The Micro User* that the 310 is the most popular entry level machine with many first time users already opting for its extra facilities in preference to the 305.

Because of this Acorn feels there would not be the market for the rumoured 205 series.

Speaking at the British Education and Training Technology Show at the Barbican Centre, Mr Page said there was no precedent to show that a low budget machine would sell and denied suggestions that a £399 Archimedes could be on the market by the summer.

## Fresh fonts

TWO new font discs are now available for Fontstyle from Database Publications. Capersoft of 36 Deburgh Road, Wimbledon, London SW19 1DU has brought out discs for text and display fonts and has also developed Fontstyle for the Archimedes.

The font discs sell at £4.95 for one or £7.95 the pair.

## ABC upgrade

DABS Press (061-766 8423) has released version two of ABC, its Archimedes Based Compiler. The upgrade now provides greater compatibility with BBC Basic V.

Price: £99.95. Free upgrade for registered users.

## The Arc only

REAL Time Solids Modeller from Silicon Vision (01-422 2274) reviewed in the January issue of *The Micro User* is only available for the Archimedes at a price of £89.95.

For BBC Micros, it has the name of Realtime Graphics Language and sells for £49.95.

# NEWS beat

## Blasting baddies is good for you – Vicar

VIOLENCE, warfare and theft are alien to the godly man but increasing numbers of the clergy are using shoot-'em-up adventure games to unwind after long days preaching the gospel.

Even pop star Cliff Richard resorts to combat games that are the opposite of his on-stage peace message.

A keen exponent of this preachers paradox is the Reverend Bob Redrup, vicar of the parish of St Kea near Truro.

He uses his BBC Micro to trade his way across the galaxy with Elite, blasting aliens and stealing their plunder.

"I think a lot of clergy need a hobby to get rid of their accumulated frustrations", he said. "Many of them are into using micros for their parish work but in the evenings, they find arcade games a lot of fun.

"Blasting baddies is very cathartic", he said. "After a day of dealing with real people and their foibles, which you would not wish to denigrate, there is no harm in bashing a piece of machinery. Clobbering a pixel is very satisfying and doesn't hurt anyone".

But even on the screen, Bob does feel the odd twinge of guilt.

"Part of Elite involves fighting pirates and scooping up their booty but when I inadvertently acquire their narcotics, I have dreadful feelings of guilt", he said. "I know it's silly because it is only an arcade game, but the natural revulsion is still there".

The Reverend Brian Snelling of St. Luke's, Hackney sees computer games on his BBC Micro as a release of anger.

"God made us to have anger and real-life violence erupts when people do not know how to use or control that anger", he said. "Even the clergy have to express this. Thumping the keys on a micro is better than thumping the nearest parishioner".

Although he admits to enjoying shoot-'em-up games, the Reverend Kendall Down of the Free Church in Rhyl is worried about increasing evidence of the occult in computer games.

"I find some of the ethics quite wrong in adventures that have occult overtones", he said. "I can disassociate reality from the screen with a lot of adventure games, but I certainly think that those leaning towards the occult are dangerous".

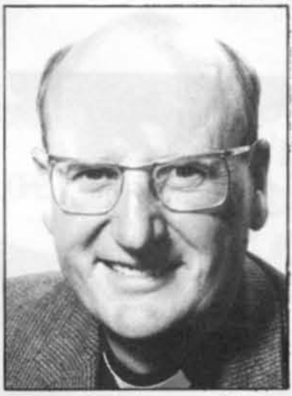


Photo: The West Briton

*The Rev Bob Redrup . . . "clobbering a pixel is very satisfying"*

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## Disc wins top award

CRUCIAL issues threatening rural areas are featured on the BBC Countryside disc which has been awarded top prize in the education category at the British Interactive Video Association's annual dinner.

Although this is an educational disc, it is designed to extend beyond schools.

At the launch of the disc, Junior Environment Minister Virginia Bottomley said: "I hope this information will be used by large numbers of people in the town and country to gain an understanding of the crucial issues facing the future of our countryside".

The disc was sponsored by British Gas, the Countryside Commission, the Department of the Environment, the Ernest Cook Trust, the Economic and Social Research Council and National Farmers Union.

It was produced by the BBC Interactive Television Unit and is published by BBC Enterprises, Education and Training.

Price £339.

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## Business welcomes Euro Show

EUROPEAN COMPUTER TRADE SHOW '89

A STRONG contingent of companies actively involved in the BBC Micro and Archimedes markets is heading for the first European Computer Trade Show.

Flying the flag for Acorn products at London's Business Design Centre from April 16 to 18 will be Watford Electronics, Superior Software, Mandarin Software, Domark and Audiogenics.

With three months to go, the unique event is already an assured success. An update reveals:

- More than 50 exhibitors confirmed – including big names from the USA, Germany, Spain, Sweden and Switzerland.
- All the mezzanine floor stands at London's Business Design Centre now sold.
- 50,000 ticket registration forms on their way to leading industry names throughout Europe and the USA.
- Star-studded speaker line-up for show seminars involving key industry figures from the USA, UK, France, Sweden, Greece, Switzerland, Italy and Holland.
- Major American trade presence expected. US personalities to include Larry Foster, the man who controls the purse strings of the world's largest retailer, Egghead Software, and Glen Ochsenreiter, director of Waldenbrooks, the 500-strong store group.
- US Software Publishers Association to attend to seek out European opportunities for its 2,000 members.
- International network of 12 agents in place and promoting the show.

"The computer industry has reacted in the most positive way possible to this event – by voting with its feet", said Michael Meakin, head of organiser Database Exhibitions (0625 879970).

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## Rumours nailed

MICHAEL Page of Acorn has discounted reports that the new Risc OS due on the Archimedes at the beginning of April is not multi-tasking.

He stressed that it has collaborative multi-tasking so long as programs used are designed for it.

It has also been reported that PipeDream will not work on Risc OS. The claim has been refuted by Colton Software (0954 211472).

Its technical director, Mark Colton, told *The Micro User*: "We have thoroughly tested PipeDream under Risc OS and it runs without any problems".

## Perfect plus

USERS of desktop publishing package Pixel Perfect now have the opportunity to upgrade from BBC B and Master ranges. AVP (0291 625439) has made the software available on the Archimedes.

Features include flexible page making, wysywig – what you see is what you get – print out and full use of sprites.

Price: £91.42.

# AMAZING SOFTWARE Bargains OFFERS!

## ELECTRON SPECIALS

ELECTRON COMPUTERS ............ £59.95
(Re-conditioned; includes power supply, serial lead & 90 day warranty)
PLUS ONE INTERFACE ................ £54.95

### PACKAGE ONE

PLUS 1, VIEW + VIEWSHEET ........ £74.95

### PACKAGE TWO

ELECTRON COMPUTER, PLUS 1, + VIEW Only ................................. £114.95

### PACKAGE THREE

VIEW + VIEWSHEET ROMS .......... £21.95

### PACKAGE FOUR

LOGO,VIEW, VIEWSHEET For ...... £49.95
And get LISP ROM FREE

### PACKAGE FIVE

PLUS 1, VOLTMACE 3B Twin Joysticks with VIEW or VIEWSHEET ............ £81.95

### PACKAGE SIX

PLUS 1, LOGO, VIEW & VIEWSHEET ................................. £114.95
And get LISP ROM FREE

## JOYSTICKS AT LOW PRICES

ELECTRON JOYSTICK INTERFACE & SOFTWARE **£14.95**
QUICKSHOT II TURBO JOYSTICK **£13.95**
**BUY BOTH £24.95!**

VOLTMACE DELTA 3B TWINS
~~£24.95~~ **£19.95**
For use with Plus 1 or BBC

VOLTMACE 14B HANDSET **£15.95**
INTERFACE FOR 14B **£14.95**
**BUY BOTH £27.95!**

VOLTMACE DELTA 3B SINGLE **£13.95**

VOLTMACE DELTA 3S **£12.95**
(for Master Compact)

## COMPETITION PRO

~~£22.45~~ **£19.95**

## ELITE ZIPSTICK

~~£15.95~~ **£10.95**

## EDUCATION

**EDUCATIONAL COMPENDIUM**
**(3-10 YRS)**

| | |
|---|---|
| Workshop | ABC |
| Spooky Manor | Talkback |
| Cass or Disk | £11.95 |

**BEST FOUR LANGUAGE**
**BEST FOUR MATHS**
**(7-11 YRS)**

| BBC DISC | COMPACT |
|---|---|
| £17.95 | £14.95 |

| | BBC or ELE CASS | DISC |
|---|---|---|
| Maths with a story 1 or 2 | £9.95 | £10.95 |
| Picture Craft (6-14yrs) | – | £15.95 |
| Answerback Junior Quiz | £7.95 | £8.95 |
| Answerback Senior Quiz | £7.95 | £8.95 |
| Happy Writing | – | £8.75 |
| Happy Numbers | – | £8.75 |

## DR WHO AND THE MINES OF TERROR!

| | RRP | Offer |
|---|---|---|
| BBC Cass & Rom .... | £18.95 | £9.95 |
| BBC Disc & Rom ...... | £19.95 | £9.95 |
| BBC B+/Master Disc | £17.95 | £8.95 |
| Compact Disc ........... | £17.95 | £8.95 |

## Archimedes

| Price | R.R.P. | Offer |
|---|---|---|
| 1st Word Plus | ~~£91.94~~ | £84.95 |
| Alerion | ~~£14.95~~ | £12.95 |
| Alpha Base | ~~£49.95~~ | £44.95 |
| Ansi C | ~~£113.85~~ | £99.95 |
| Archimedes Dust Cover | — | £14.95 |
| Archimedes Ref. Manual | — | £29.95 |
| Arctist | ~~£19.95~~ | £17.95 |
| Artisan Support Disk | ~~£19.95~~ | £17.95 |
| Artisan | ~~£39.95~~ | £34.95 |
| Autosketch | ~~£90.85~~ | £79.95 |
| Creations Disk | ~~£19.95~~ | £15.95 |
| Conqueror | ~~£24.95~~ | £19.95 |
| Corruption (New!) | ~~£24.95~~ | £19.95 |
| Deltabase | ~~£29.95~~ | £25.95 |
| Desk Top Enhancer | ~~£29.95~~ | £24.95 |
| Fireball (New!) | ~~£19.95~~ | £13.95 |
| Flying Start 2 | ~~£99.95~~ | £89.95 |
| Fortran 77 | ~~£113.85~~ | £99.95 |
| Freddy's Folly (New!) | ~~£14.95~~ | £11.95 |
| Gama Plot | ~~£69.95~~ | £59.95 |
| Graphic Writer | ~~£29.95~~ | £24.95 |
| Hoverbod | ~~£14.95~~ | £11.95 |
| Interchart | ~~£28.75~~ | £24.95 |
| Intersheet | ~~£44.85~~ | £39.95 |
| Interword | ~~£44.85~~ | £39.95 |
| ISO Pascal | ~~£113.85~~ | £99.95 |
| Jet Fighter | ~~£14.95~~ | £11.95 |
| Kermit | ~~£56.35~~ | £49.95 |
| Lisp | ~~£228.85~~ | £219.95 |
| Logistix | ~~£113.85~~ | £99.95 |
| Minotaur | ~~£14.95~~ | £11.95 |
| Missile Control | ~~£14.95~~ | £11.95 |
| Nominal Ledger | ~~£64.95~~ | £54.95 |
| Order Processing/Invoicing | ~~£64.95~~ | £54.95 |
| Orion (New!) | ~~£14.95~~ | £11.95 |
| Pac Mania | ~~£19.95~~ | £17.95 |
| PC Emulator | ~~£113.85~~ | £113.85 |
| Personal Accountant | ~~£279.99~~ | £249.95 |
| Pipedream | ~~£113.85~~ | £99.95 |
| Presenter | ~~£28.69~~ | £24.95 |
| Pro Artisan | ~~£169.95~~ | £154.95 |
| Prolog | ~~£228.95~~ | £215.95 |
| Purchase Ledger | ~~£64.95~~ | £54.95 |
| Sales Ledger | ~~£64.95~~ | £54.95 |
| Sigma Sheet | ~~£69.95~~ | £59.95 |
| Sound Synth | ~~£49.95~~ | £44.95 |
| Spellmaster | ~~£58.99~~ | £49.95 |
| Stock Management | ~~£64.95~~ | £54.95 |
| System Delta Plus | ~~£69.95~~ | £59.95 |
| Terramex | ~~£19.95~~ | £17.95 |
| Toolkit Module | ~~£39.95~~ | £34.95 |
| Twin | ~~£33.35~~ | £29.95 |
| U-Connect | ~~£59.95~~ | £49.95 |
| View 3 | ~~£59.80~~ | £49.95 |
| Wordwise + | ~~£28.00~~ | £19.95 |
| Zarch | ~~£19.95~~ | £17.95 |

## WORD PROCESSORS

| TITLE | F | RRP | SALE |
|---|---|---|---|
| Hi View | D | 59.80 | 49.95 |
| Inter-Word | R | 56.35 | 49.95 |
| Mega 3 | R | 97.75 | 84.95 |
| Overview | R | 96.90 | 79.45 |
| Printer D Generator | D | 11.50 | 9.50 |
| Printmaster (Epson) | R | 33.35 | 28.95 |
| Spellmaster | R | 58.00 | 49.95 |
| View 3.0 | R | 59.80 | 44.95 |
| View: Dabhand Guide | D | 7.95 | 6.95 |
| View Index | D | 14.95 | 11.50 |
| View Professional | D | 99.95 | 79.45 |
| Viewspell | R | 39.95 | 31.95 |
| Wordwise | R | 45.42 | 35.95 |
| Wordwise+ | R | 56.35 | 45.95 |

## SPREADSHEETS

| TITLE | F | RRP | SALE |
|---|---|---|---|
| Inter-Sheet | R | 56.35 | 49.95 |
| Ultracalc 2 | R | 29.95 | 24.95 |
| Viewsheet | R | 59.80 | 49.95 |

## INTEGRATED OFFICE SUITE

| TITLE | F | RRP | SALE |
|---|---|---|---|
| Mini Office | C | 5.95 | 4.75 |
| Mini Office II | C | 14.95 | 11.95 |
| Mini Office II | H | 59.95 | 54.95 |
| Mini Office II 40t | D | 16.95 | 13.95 |
| Mini Office II 80t | D | 16.95 | 13.95 |
| Mini Office II M40t | D | 19.95 | 15.95 |
| Mini Office II M80t | D | 19.95 | 15.95 |

## RECENT RELEASES AT SPECIAL PRICES

| | BBC or ELE | BBC Disc | BBC Comp. |
|---|---|---|---|
| Acornsoft Hits 1 | 4.95 | 9.50 | 11.50 |
| Acornsoft Hits 2 | 4.95 | 9.50 | 11.50 |
| Barbarian | 7.45 | 9.50 | 11.50 |
| Bonecruncher | 7.45 | 9.50 | 11.50 |
| Breakthrough | 7.45 | 9.50 | 11.50 |
| By Fair Means or Foul | 7.45 | 9.50 | 11.50 |
| Codename Droid | 7.45 | 9.50 | 11.50 |
| Crazee Rider | 7.45 | 9.50 | 11.50 |
| Elixir | 7.45 | 9.50 | 11.50 |
| Exile | 9.95 | 11.95 | 15.95 |
| Kourtyard | 7.45 | 9.50 | – |
| Life of Repton | 5.50 | 6.50 | 7.95 |
| Palace of Magic | 7.45 | 9.50 | 11.50 |
| Pipeline | 7.45 | 9.50 | 11.50 |
| Play it Again Sam | 7.45 | 9.50 | 11.50 |
| Play it Again Sam 2 | 7.45 | 9.50 | 11.50 |
| Play it Again Sam 3 | 7.45 | 9.50 | 11.50 |
| Play it Again Sam 4 | 7.45 | 9.50 | 11.50 |
| Play it Again Sam 5 | 7.45 | 9.50 | 11.50 |
| Play it Again Sam 6 | 7.45 | 9.50 | 11.50 |
| Quest | 7.45 | 9.50 | 11.50 |
| Repton Infinity | 9.95 | 11.95 | 15.95 |
| Skirmish | 7.45 | 9.50 | – |
| Spellbinder | 7.45 | 9.50 | 11.50 |
| Spy Cat | 7.45 | 9.50 | 11.50 |
| Spy vs Spy | 7.45 | 9.50 | 11.50 |
| Strykers Run | 7.45 | 9.50 | 11.50 |
| Superior Collection 1 | 7.45 | 9.50 | 11.50 |
| Superior Collection 2 | 7.45 | 9.50 | 11.50 |
| Superior Collection 3 (Ele) | 7.45 | 9.50 | 11.50 |
| The Last Ninja | 7.45 | 9.50 | 11.50 |

## DESKTOP PUBLISHING

| TITLE | F | RRP | SALE |
|---|---|---|---|
| Admin Extra (40T) | D | 14.95 | 11.95 |
| Admin Extra (80T) | D | 14.95 | 11.95 |
| Fleet St Editor (40T) | D | 39.95 | 29.95 |
| Fleet St Editor (80T) | D | 39.95 | 29.95 |
| Fonts & Graphics 4 | D | 14.95 | 11.95 |
| Fonts & Graphics 8 | D | 14.95 | 11.95 |
| Stop Press (Mas) | D+R | 49.95 | 41.95 |
| Stop Press (B/B+) | D+R | 49.95 | 41.95 |
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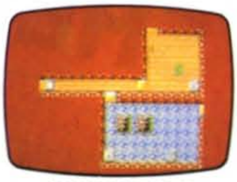
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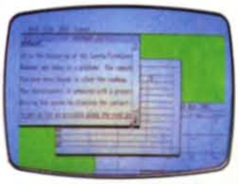
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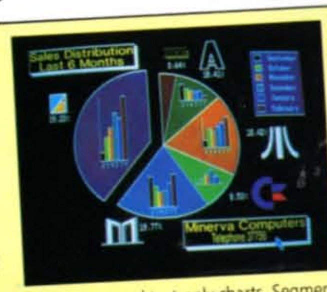

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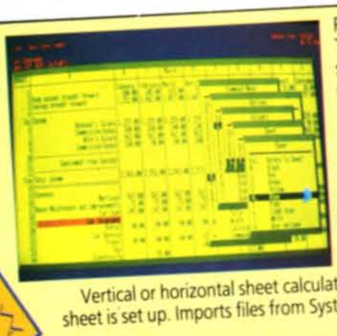

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# Clock that speeder!

Greg Monney has a program that checks up on passing traffic

**HOW often have you sat at home, in the office or in your classroom and seen traffic speeding by in what is meant to be a 30 mile an hour limit? How often have you wondered just how fast those lorries are going when they rattle your windows? Or perhaps you live in sight of a motorway and cannot believe that there is a national 70 mile an hour limit.**

Unfortunately, it is not easy to judge vehicle speeds and very few people are able to do so with any degree of accuracy. But now you can – with Speeder.

The program will give you all the information you need, perhaps for a school project or to lobby your local council about the local traffic speed problem. At the press of a couple of keys you will be able to get an instant and accurate read out of the speed of any vehicle passing and the program will also record the data in a file for later use or full analysis. A second program, Graphlt, will plot a simple bar chart for an easy overview of the speeds recorded.

First type both programs into your BBC Micro and use the checksums to ensure they are entered correctly. If you are using a Z88 make the changes shown in Panels I and II before transferring the routines over.

Before starting work, choose two places along the road which you can see from a convenient vantage point. Markers are a help here – lampposts or trees do very well – and they need to be a known distance apart over 20 metres.

Having selected and measured your distance, you are now ready to retire to your hiding place behind a bush – with a Z88 – or in the comfort of a warm room overlooking the road and start your traffic speeds survey.

Run Speeder and enter the distance you measured earlier. Now when a vehicle passes the first marker a keypress will start the timer and a second – at the second marker – will stop it. The speed in metres a second, kilometres an hour and miles an hour will be calculated and displayed.

If you have hit a key by mistake a rapid second press will cancel the timer and the message *Reading ignored* will be displayed. The speed calculated is limited to under 100 miles an hour, so if you live in a penthouse overlooking Brands Hatch or Silverstone and want to try your hand at timekeeping you will have to modify the value at line 180 to include faster speeds.

When you have taken enough readings for your sample, press Escape to save the data to a file – called speeds. The Graphlt program is chained

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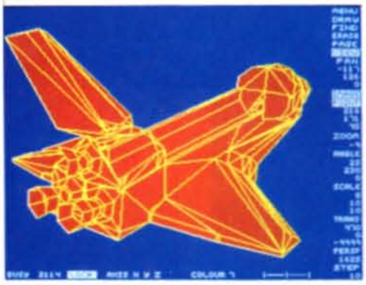
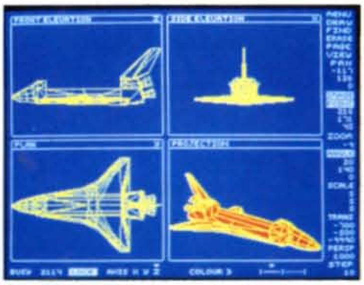
### SolidCAD





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### REALTIME SOLIDS MODELLER

The package includes both the sophisticated design environment of SolidCAD and the high speed animation capability of a Realtime Graphics Language (RGL) module developed in pure ARM Risc code for supercharged performance. The package is ideal for Architectural design, Interior design, Engineering design & teaching CDT. The RGL module can be used to create standalone flicker-free animation of designs from your own programs. Smooth shading is also performed for realistic images. Through our in-house expertise in 3D Design and High-speed techniques, no other package can rival the design environment & animation speed of the Realtime Solids Modeller.

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### REALTIME GRAPHICS LANGUAGE

The Realtime Graphics Language rom provides a complete 3D Solids/Wireframe animation system with 52 star commands and 3D Editors for designing objects to animate from your own programs. Includes a 35,000 pixels/sec line generator for fast 3D drawing rates, 3D Rotate, Scale, Orbit, Perspective and Turtlegraphics. Also compatible with designs created with SolidCAD (BBC).

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### SUPER-DUMP

The ultimate printer driver which takes advantage of the highest resolution capability of ordinary Epson compatible printers to provide 1920 × 1024 resolution. Images can also be scaled, positioned and previewed before printing. Fully compatible with SolidCAD, Realtime Graphics Language, Gate-Array design system & 3D CAD/Animation system. Your own graphics programs or other CAD packages can be made compatible with Super-Dump by the addition of a few simple commands. An example program is included in the package.

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### Presentation System

The package provides an interactive environment to create, edit and play-back computer controlled presentations for lectures and demonstrations. Also handles graph plotting for polynomials & user-defined functions which can be incorporated within the presentations.

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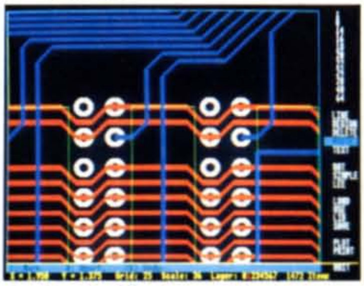

The ultimate PCB design system developed specifically for the Archimedes with a specification that cannot be matched. Includes Automatic routing, Rats-nesting, 8 layers, Surface mount capability, 0.001" resolution, 32" × 32" maximum board size, On-line Help, Fast Zoom/Pan/Redraw, Text & Silkscreen facility, Variable Line/Pad/Text/Grid sizes, Part Libraries, Block Move/Copy/Rotate/Mirror/Erase options, and up to 300,000 components.

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### Risc BASIC

The first true BASIC V syntax compiler which will convert your programs into supercharged Risc code for turbo performance leaving the competition standing. Features include Relocatable modules, full cross references, Double precision floating point & Integer support, in-line assembly, Window-based or command line compilation environment, standalone code generator, object code optimiser, full array manipulation and dimensions support, multiple exit structures & full runtime error handler.

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### RiscFORTH

A new 32-bit implementation of the FORTH-83 standard, designed to take full advantage of the ARM architecture. Features include Multi-tasking, Optimising compiler, built-in ARM assembler with floating point mnemonics, built-in Full screen Editor, File system interface, OS calls support, Floating point & Integer maths, WIMP support, Single-step debugger, Shadow screen for documentation, Block manipulation, Dictionary & Vocabulary display, Call finding and a standalone code generator.

£99.95 (ARC) New

### Speeder changes for Z88

Alter the following lines for the Z88 version:

```
 40 *NAME SPEEDER
330 A$=CHR$(1)
345 CLS
350 PROChead("     CAR SPEED TIMER     "
):REM 5 SPACES
400 VDU12,1,55,35,49,52,32,90,40,129
405 VDU1,55,35,50,33,33,49,39,131,12
425 PRINT A$;"212"
426 PROChead("CAR SPEED TIMER")
435 PRINT A$;"211";A$;"S"
480 VDU1,70:PRINTM$:VDU1,70
510 PRINT TAB(0,0)A$;"R ";H$+" ";A$;"R"
540 VDU1,50,73,56,1,127,1,67,1,83
```

and delete line 450.

### GraphIt changes for Z88

Alter the following lines for the Z88 version:

```
260 IF A(I%)>=8-row% PRINT;D$; ELSE FOR
J%=1TO2:VDU32-63*(row%=7):NEXT
290 PRINT"A B C D E F G H I J K L M N O
P Q R S T";
300 PRINTTAB(56,0)H$"CAR SPEEDS DISTRIBU
TION";HO$
340 PRINTTAB(34+12*(I%),J%+1)CHR$(59+5*I
%+J%)"=";25*I%+5*J%-30"-"25*(I%-1)+5*J%-
1" mph"
500 CLS
510 N%=20
520 *NAME DISPLAY
530 D$=CHR$255
540 VDU1,138,61,65,159,159,159,159,159,1
59,159,159
542 VDU1,138,61,66,190,190,190,190,190,1
90,190,190
544 D$=CHR$1+CHR$130+CHR$63+CHR$65+CHR$1
+CHR$130+CHR$63+CHR$66
546 H$=CHR$1+"R  ":HO$="  "+CHR$1+"R"
```

and delete lines 210 and 310.

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automatically and this will plot the results in a simple bar chart. Depending on the number of observations taken and their spread, the graph is automatically scaled to accommodate all the data.

There are a couple of very important points to bear in mind when using the programs:

- Always make sure that you are viewing the traffic from a safe place, preferably well away from the road. Choose a spot that is both safe for you and for the motorists.
- If the results are to be reliable, you should make sure that you are not visible to the motorists. Any driver who sees someone by the side of the road with a micro or black box is likely to slow down.

The programs were originally written for use on the Z88 and the true portability of the machine comes into its own in a use such as this. However if you have a mains supply within sight of a road they work equally well on a BBC Micro, and the core versions listed are for that.

### SPEEDER MAIN PROCEDURES

| | |
|---|---|
| **err** | Detects Escape and saves Speeds file – or ends program and reports error |
| **instns** | Opens data file and gives instructions |
| **screen** | Sets up input screen with on-screen instructions |
| **measure** | Detects key presses and calculates speeds |
| **form** | calculates speed in different units m/s, km/h and mph |
| **reset** | Resets machine and clears screen on exit |

### GRAPHIT MAIN PROCEDURES

| | |
|---|---|
| **init** | Sets up defined characters for display of bar chart |
| **read** | Reads data from speeds file and sorts into 5 mph classes |
| **scale** | Scales Y axis if number of readings in class exceeds 8 |
| **display** | Plots histogram |

```
   10 REM Speeder
   20 REM by G.J. Monney
   30 REM (c) The Micro User
   40 MODE7
   50 ON ERROR PROCerr
   60 PROCinstns
   70 PROCscreen
   80 REPEAT
   90 PROCmeasure
  100 UNTILFALSE
  110 END
  120 DEFPROCmeasure
  130 A=GET:TIME=0
  140 PROCflash("TIMING ...")
  150 A=GET:tim=TIME
  160 tim=tim/100:s=dist/tim
  170 speed=FNform(s,1):speedk=FNform(s,
3.6):speedm=FNform(s,2.237)
  180 IF speedm>99 THENVDU11:PRINT"Read
ing ignored":GOTO210
  190 PRINT#ch%,speedm
  200 VDU11:PRINT"Speed: ";speed;" m/s :
 ";speedk;" km/h : ";speedm;" mph"
  210 ENDPROC
  220 DEFFNform(X,C)
  230 =(INT(X*C*10+.5))/10
  240 DEFPROCerr
  250 ON ERROR OFF
  260 CLOSE#0
  270 PROCreset
  280 IF ERR<>17 REPORT:PRINT" at line"
;ERL:END
  290  PRINT"Data saved as the file "s
peeds"":D=INKEY(200)
  300 CHAIN"GraphIt"
  310 ENDPROC
  320 DEFPROCinstns
  330 @%=&20105
  340 ch%=OPENOUT("speeds")
  350 PROChead("CAR SPEED TIMER")
  360 VDU28,0,23,39,2
  370 PRINT"This program measures car s
peeds."
  380 PRINT"Please enter the distance i
n metres over which the car speeds are t
o be measured: ";
  390 INPUT""dist
  400 CLS
  410 ENDPROC
  420 DEFPROCscreen
  430 PRINT"  Press any key    to start
/stop""    ESC to end"
  440 PROChead("RESULTS")
  450 VDU28,0,23,39,8
  460 ENDPROC
  470 DEFPROCflash(M$)
  480 PRINTCHR$&88M$CHR$&89
  490 ENDPROC
  500 DEFPROChead(H$)
  510 FORI=0TO1:PRINTCHR$&81;CHR$&9D;CHR
$&83;CHR$&8D;:PRINTTAB(19-LENH$DIV2);H$:
NEXT
  520 ENDPROC
  530 DEFPROCreset
  540 VDU28,0,23,39,2
  550 CLS
  560 ENDPROC
```

Get it right!

```
 10 =    0 0
 20 =    0 0
 30 =    0 0
 40 = 8AFC C
 50 = 2D1B 5
 60 = 3545 6
 70 = 9538 F
 80 = BFBA 5
 90 = 8CC6 9
100 = E014 F
110 = FD2E A
120 = 6160 1
130 = 5E0D 5
140 = 621D A
150 = B62A 9
160 = B152 9
170 = 11B0 7
180 = 7FBF 7
190 = A2BE A
200 = F989 8
210 = ED0F 1
220 = 24D2 5
230 = 172C B
240 = 24C8 0
250 = F4C9 B
260 = 9EE3 4
270 = EDFA F
280 = 84CA 7
290 = E68C 9
300 = 323D 2
310 = ED0F 3
320 = 55C4 2
330 = 9213 6
340 = 5735 D
350 = A18D C
360 = A331 5
370 = B860 9
380 = CF9F 3
390 = 8CF1 6
400 = 7A16 1
410 = ED0F B
420 = F5B9 D
430 = 5061 5
440 = E028 1
450 =  27B 5
460 = ED0F E
470 = 61B1 A
480 = 3621 4
490 = ED0F D
500 = F2D8 C
510 = 23FA 1
520 = ED0F 4
530 = 469E 4
540 = A331 F
550 = 7A16 0
560 = ED0F F
```

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```
 10 REM Graph It
 20 REM by G.J. Monney
 30 REM (c) The Micro User
 40 PROCinit
 50 DIMA(N%)
 60 PROCread
 70 PROCscale
 80 PROCdisplay
 90 END
100 DEFPROCread
110 FORI%=0TON%:A(I%)=0:NEXT
120 ch%=OPENIN("speeds")
130 REPEAT
140 INPUT#ch%,s
150 x=1+s DIV5
160 A(x)=A(x)+1
170 UNTILEOF#ch%
180 CLOSE#ch%
190 ENDPROC
200 DEFPROCdisplay
  210 PRINT
  220 FORrow%=1TO7
  230 PRINT;INT((8-row%)/scale+.5);
  240 PRINTTAB(3)"_";
  250 FORI%=1TON%
  260 IF A(I%)>=8-row% PRINT;D$; ELSE PR
INT;" ";
  270 NEXT:PRINT:NEXT
  280 PRINTTAB(4);
  290 PRINT"ABCDEFGHIJKLMNOPQRST"
  300 PRINTTAB(5,12)H$"CAR SPEEDS DISTRI
BUTION";HO$
  310 PRINTTAB(5,13)H$"    figures in m.
p.h.  ";HO$
  320 FORI%=1TO4
  330 FORJ%=1TO5
  340 PRINTTAB(10*(I%-1),14+J%)CHR$(59+5
*I%+J%)"=";25*I%+5*J%-30"-"25*(I%-1)+5*J
%-1
  350 NEXT:NEXT
  360 ENDPROC
  370 DEFPROCscale
  380 max%=0
  390 FORI%=1TON%
  400 IFA(I%)>max% THEN max%=A(I%)
  410 NEXT
  420 scale=1
  430 IF max%<9 THENENDPROC
  440 scale=8/max%
  450 FORI%=1TON%
  460 A(I%)=INT(A(I%)*scale+.5)
  470 NEXT
  480 ENDPROC
  490 DEFPROCinit
  500 @%=&10:CLS
  510 N%=20
  520 REM DEFINE CHARACTER
  530 D$=CHR$255
  540 H$=CHR$131+CHR$157+CHR$129:HO$=CHR
$32+CHR$131+CHR$156
  550 ENDPROC
```

**Get it right!**

```
 10 =    0 0
 20 =    0 0
 30 =    0 0
 40 = DEBB B
 50 = 6757 1
 60 = B06A 7
 70 = F5B9 5
 80 = 2F83 2
 90 = FD2E 9
100 = 5A9D E
110 = 47F4 0
120 = FD4F 0
130 = BFBA 1
140 = 3BF0 5
150 = 8206 1
160 = FABE D
170 = 57FD 0
180 =  773 9
190 = ED0F C
200 = C225 6
210 = 7475 0
220 = FC5E 7
230 = BA96 A
240 = 5C28 5
250 = 42F6 D
260 = 5EA4 2
270 = 4C8B E
280 =  2B7 6
290 = 2F1E A
300 = CE11 8
310 = E74B 5
320 = CFF9 3
330 = 1138 1
340 = 9100 B
350 = 24BD E
360 = ED0F 7
370 = 5EDD 0
380 = 4DCC D
390 = 42F6 4
400 = 881A 2
410 = 2C83 9
420 = 4D56 F
430 = 176A 9
440 = 7E27 5
450 = 42F6 D
460 = C617 4
470 = 2C83 0
480 = ED0F 6
490 = 344C 4
500 = 4ACF D
510 = 879B B
520 =    0 B
530 = FD13 E
540 = DC42 A
550 = ED0F F
```

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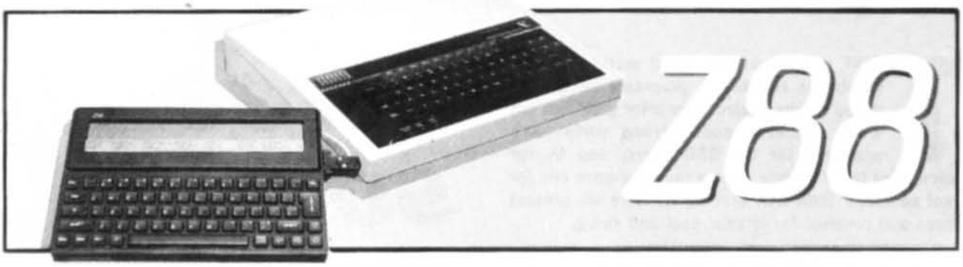

# Accent on the output

**IN the April 1988 issue of *The Micro User* we explained how to use a printer with your Z88. There was a handy little printer server program that allowed a Z88 to output data to a printer via a BBC Micro. Now let's look at how to use the Z88's PipeDream printer driver from within Basic programs. Why might this be useful? The main reason is all to do with the Z88's portability.**

Putting effect codes like underline directly into a program means that it can only be used with one particular type of printer. On a fixed BBC Micro system this is unlikely to be a problem, but a Z88 may be used with more than one printer – say a dot matrix at home and a daisywheel in the office.

By sending all the output through the PipeDream printer driver, changing printer is just a matter of loading a new definition file.

Using the driver is not difficult. First the printer has to be opened in the program in the same way as a file – using the device name :PRT.0 instead of the usual filename, for example:

```
X=OPENOUT":PRT.0"
```

Then use PRINT#X or BPUT#X to send output to the printer. It is worth mentioning that PRINT# on the Z88 is different to the corresponding instruction on the BBC Micro. Each string is sent to the file or device followed by a Return, rather than in the BBC Micro's internal form.

This means each line sent has to be a single string and in practice this is achieved by converting everything to strings – use STR$ for numbers – and using + instead of the normal , separator. When you've finished with the printer the channel should be closed like a file:

```
CLOSE#X
```

The printer driver is activated by a series of commands to the VDU drivers. These are always the number 5 followed by an Ascii code. First you must ensure that the driver is active using:

```
BPUT#X,5:BPUT#X,ASC"["
```

In this case BPUT# is used to send the two bytes because PRINT# would also send a Return. PipeDream printer effects are now possible. Fortunately the codes required are identical to the letter needed after the ◊P in PipeDream for the same effect. It's easier to define a function to send these codes via PRINT#:

```
DEF FNP(A$)=CHR$(5)+A$
```

Then if, for example, you want to underline, just add FNP("U") to the string at the appropriate place. Remember that an effect will be turned off at the end of a line if that's how it is set in the driver.

As you can see from the example listing there's not much to it at all.

```
   10 REM Using the Z88 Printer Driver
   20 REM by John Allen
   30 REM (C) The Micro User
   40 :
   50 REM Open the Printer for output
   60 X=OPENOUT":PRT.0"
   70 :
   80 REM Activate the Printer Driver
   90 BPUT#X,5:BPUT#X,ASC"["
  100 :
  110 text$="This is some text"
  120 :
  130 REM underlining and italics
  140 PRINT#X,text$+" "+FNP("U")+text$+"
 "+FNP("U")+text$
  150 PRINT#X,text$+" "+FNP("I")+text$+F
NP("I")+" "+text$
  160 :
  170 CLOSE#X
  180 END
  190 DEF FNP(A$)=CHR$(5)+A$
```

### Printer driver commands

| | BPUT# form | PRINT# form |
|---|---|---|
| Printer driver on | 5,ASC“[” | CHR$(5)+“[” |
| Printer driver off | 5,ASC“]” | CHR$(5)+“]” |
| Underline | 5,ASC“U” | CHR$(5)+“U” |
| Bold | 5,ASC“B” | CHR$(5)+“B” |
| Extended sequence | 5,ASC“X” | CHR$(5)+“X” |
| Italics | 5,ASC“I” | CHR$(5)+“I” |
| Subscript | 5,ASC“L” | CHR$(5)+“L” |
| Superscript | 5,ASC“R” | CHR$(5)+“R” |
| Alternate font | 5,ASC“A” | CHR$(5)+“A” |
| User defined | 5,ASC“E” | CHR$(5)+“E” |

*The Z88 has good output facilities. Here John Allen shows you how to use them to best effect*

## Z88 Software

**In this issue there are two other programs for your Z88:**

- ***Speeder* on Page 21 lets you measure the speed of passing cars.**
- ***Patience* is a version of the classic card game and is on Page 53.**

**Both programs are listed for the BBC Micro and necessary changes for the Z88 are given.**

# Three sorts of Basic

## *Discover how to put things in order with Peter Vasey*

**THERE is a fascination about sorting systems which has resulted in programs being published on the subject year after year. But not many machine code string sorts have appeared for the BBC Micro, and to our knowledge there's never been a machine code one for real numbers. Until now that is, for here we present three sort routines for integer, real and string.**

We use the shell sort algorithm as it is much more efficient than the old bubble sort and even for larger data lists it is acceptably fast. Because it's not recursive it is straightforward to convert to machine code – no stack is needed to keep track of the loop nesting.

Consequently on the BBC Micro it is relatively easy to make the code relocatable, so that any program can use it without reassembly. Furthermore the Basic version by Phil Bender published in Program Library (October 1988) uses division by 2 instead of the more common logarithmic split of the table to be sorted. This is very much easier to code, so we'll use this sorting algorithm for our present programs.

Next month we'll be looking at a general purpose version plus a program that will sort whole data blocks – immensely useful for databases.

> *Shell sort algorithm is much more efficient than the old bubble sort . . . and acceptably fast*

Listing I is the shell sort algorithm for Basic integer arrays. Listing II is designed to be merged with the first to convert it to a string sort. Listing III – also designed to be merged with Listing I – produces a real number sort. All the routines take a similar time – around two seconds for 500 items – and each can be designated as ascending or descending sorts. The string sort can also be set to treat small letters the same as capitals.

So type in each listing in turn, checking them with Get it Right! and saving them to disc as Integer, StringV and RealV. To create the string version follow this sequence:

```
LOAD"StringV"
*SPOOL StrAsc
LIST
*SPOOL
LOAD"Integer"
*EXEC StrAsc
SAVE"String"
```

Follow the same procedure using RealV to produce the floating point sort routine. Remember, the errors generated as you *EXEC a spooled file into your micro are harmless and do not affect the program in memory.

When you type in the main program, make sure you number the lines as they are printed – in multiples of 20. This is to leave room for the extra ones entered when converting to string or real sorts and for next month's general purpose routines.

| | | | |
|---|---|---|---|
| &600 | 2 | | Number of parameters passed |
| &601 | 21 | ) | Address of first parameter |
| &602 | 2F | ) | is &2F21 |
| &603 | 4 | | First parameter type (integer) |
| &604 | 25 | ) | Address of second parameter |
| &605 | 2F | ) | is &2F25 |
| &606 | 4 | | Second parameter type (integer) |

*An example of two integer variables being passed*

### The integer sort

The Basic section of the program sets up and tests the routine. Points to note are the setting of the direction flag and the method of calling the machine code. The variable *dirn* is simply a flag which the machine code needs to determine whether to sort the items into ascending or descending order – zero or non-zero respectively. In a stand alone program you will need either to declare dirn=&80 or use ?&80 directly.

The actual initiation of the sort is straightforward. BBC Basic's CALL command is very clev-

```
   20 REM MACHINE CODE SHELL SORT
   40 REM INTEGER ARRAYS
   60 REM By Peter Vasey
   80 REM (C) The Micro User 1989
  100 :
  120 MODE7:PROCassem
  140 DIMA%(1000)
  160 REPEAT
  180 INPUT'"How many numbers to be sort
ed? "N%
  200 PRINT'"(A)scending or (D)escending
 order? ";
  220 REPEATA%=GETAND223:UNTILA%=ASC"A"O
RA%=ASC"D"
  240 VDUA%:?dirn=0:IFA%=ASC"D" ?dirn=1
  260 PRINT'"Setting up ..."
  280 FORI%=1TON%:A%(I%)=RND(10000)-5000
:NEXT
  300 PRINT"Sorting ..."
  320 TIME=0:CALLSORT,N%,A%(1):T%=TIME
  340 REM FORI%=1TON%:PRINTA%(I%):NEXT
  360 PRINT"Time for sort = ";T%/100" se
cs."
  380 PRINT"Checking ... ";
  400 FORA%=1TON%-1:IF?dirn=0:IFA%(A%)>A
%(A%+1) PROCERROR
  420 IF?dirn=1:IFA%(A%)<A%(A%+1) PROCER
ROR
  440 NEXT:PRINT"OK"
  460 UNTILFALSE
  480 END
  500 DEFPROCERROR
  520 VDU7:PRINT'"ERROR AT ";A%:END
  540 :
  560 DEFPROCassem
  580 params=&600:varptr=&604
  600 count=&70:gap=&72:items=&74
  620 g=&76:j=&78:k=&7A
  640 jptr=&7C:gptr=&7E
```

erly arranged to allow us to pass variables into our machine code routines. See your User Guide pages 214 and 446 for further details. It sets up a table of pointers at &600 which we can read from our code. Table I gives an example for two integer variables being passed. The parameter types we are concerned with are integer, real and string represented by codes &04, &05 and &81.

Since numerical arrays are stored consecutively all we need to do is specify the number of items to sort and the first item in the array to be sorted. So:

```
CALL Sort,N%,A%(1)
```

will tell the routine to sort *N%* items of *A%()* starting at element 1. You can therefore sort just a section of the array but be very careful not to spill over the end – no check is made on the size and if you exceed the limits you'll corrupt other variables and the array itself.

Be very careful if you try to sort a multi-dimensional array because the way it's stored means that you can only sort certain elements. For an array set up as *A%(2,300)* you can only sort the second elements. It is as well to do a test run before attempting to program for these more ambitious sorts.

You will see a number of rather odd looking link labels in the code. These are to allow us to load the code anywhere in user ram and run it as it stands – the code is relocatable. All the zero page addresses used are safe. So all we need to do to use the code from any Basic program is to proceed as follows:

- ● First RUN the appropriate program module – integer, string or real – and then:

```
*SAVE CODE 900+200
```

Add the following lines to the start of your own program:

```
DIM Sort 350
DIMX%-1:Y%=X%DIV256
$X%="LOAD CODE "+STR$~Sort
CALL&FFF7
```

You can then use the code as before, for

Turn to Page 28 ▶

## SORTING INTEGER ARRAYS

Integer variables are straightforward. Each variable is stored in four bytes, with the most significant last. Since the value is represented directly, the numbers can be immediately compared. The elements of a single dimension array follow each other directly, so to find the next element we increase the counter by four. Sorting individual elements is then a matter of comparing and if necessary swapping the four bytes pointed to by the array pointers set up in lines 1320 and 1340.

```
 660 dirn=&80:swapflag=&81
 680 :
 700 FORN%=0TO2STEP2
 720 P%=&900
 740 [OPTN%
 760 .SORT
 780 LDAparams:CMP#2:BNEbad
 800 LDAparams+3:CMP#4:BNEbad
 820 LDAparams+6:CMP#4:BEQgood
 840 .bad BRK
 860 ]
 880 $P%=CHR$255+"Bad CALL"+CHR$7
 900 P%=P%+10
 920 [OPTN%
 940 BRK
 960 .nosort RTS
 980 .good LDAparams+1:STA&70:LDAparams
+2:STA&71
 1000 LDY#0:STYgap+1:LDA(&70),Y:STAitems
 1020 INY:STYgap:LDA(&70),Y:STAitems+1
 1040 BMI bad:BNErepeat1:LDXitems:BEQnos
ort:DEX:BEQnosort
 1060 .repeat1
 1080 CLC:LDAgap:ADCgap:STAgap
 1100 LDAgap+1:ADCgap+1:STAgap+1
 1120 LDAgap:CMPitems:BNEntequ:CLC
 1140 .ntequ LDAgap+1:SBCitems+1:BCCrepe
at1
 1160 LDAgap:SBC#1:STAgap:BCSrepeat2:DEC
gap+1
 1180 .repeat2
 1200 LSRgap+1:RORgap
 1220 LDX#0:STXk:STXk+1
 1240 SEC:LDAitems:SBCgap:STAcount:LDAit
ems+1:SBCgap+1:STAcount+1
 1260 .for LDAk:STAj:LDAk+1:ASLj:ROLA:AS
Lj:ROLA:STAj+1
 1280 .repeat3 LDAgap:STAg:LDAgap+1:ASLg
:ROLA:ASLg:ROLA:STAg+1
 1300 CLC:LDAg:ADCj:STAg:LDAg+1:ADCj+1:S
TAg+1
 1320 CLC:LDAvarptr:ADCj:STAjptr:LDAvarp
tr+1:ADCj+1:STAjptr+1
 1340 CLC:LDAvarptr:ADCg:STAgptr:LDAvarp
tr+1:ADCg+1:STAgptr+1
 1360 LDY#0
 1380 .forlink BNEfor
 1400 .repeat2link BNErepeat2
 1420 BEQcompare
 1440 .comeback LDAswapflag:BEQnext:LDY#
3
 1460 .loop2 LDA(jptr),Y:PHA:LDA(gptr),Y
:STA(jptr),Y
 1480 PLA:STA(gptr),Y:DEY:BPLloop2
 1500 SEC:LDAj:SBC#4:STAj:LDAj+1:SBC#0:S
TAj+1
 1520 BPLrepeat3
 1540 .next INCk:BNEon:INCk+1
 1560 .on LDAk:CMPcount:BNEforlink
 1580 LDAk+1:CMPcount+1:BNEforlink
 1600 LDAgap+1:BNErepeat2link
 1620 LDXgap:DEX:BNErepeat2link
 1640 RTS
 1660 :
 1680 .compare STYswapflag:LDXdirn:BEQas
c:LDX#1
 1700 .ptloop LDAjptr,X:PHA:LDAgptr,X:ST
Ajptr,X
 1720 PLA:STAgptr,X:DEX:BPLptloop
 1740 .asc LDX#4:SEC
 1760 .loop LDA(gptr),Y:SBC(jptr),Y
 1780 INY:DEX:BNEloop:BVCnoov:EOR#&80
 1800 .noov EOR#0:BPLcomeback
 1820 INCswapflag:BNEcomeback
 1840 ]
 1860 NEXT
 1880 ENDPROC
```

**Get it right!**

```
  20 =    0 0 | 660 = AAF9 C | 1300 =  3AC A
  40 =    0 0 | 680 = 9719 D | 1320 = A514 1
  60 =    0 0 | 700 = 2395 D | 1340 =  6E2 5
  80 =    0 0 | 720 = C92F 4 | 1360 = 9B97 B
 100 = 9719 9 | 740 = 6A96 9 | 1380 = A912 2
 120 = D07F 5 | 760 = 6ACB 5 | 1400 = 272B 8
 140 = A1D7 A | 780 = F89C 1 | 1420 = 7D01 A
 160 = BFBA C | 800 =  D95 4 | 1440 = EA62 F
 180 = D6C5 6 | 820 = 6881 D | 1460 = 9162 8
 200 = 8090 C | 840 = 6913 5 | 1480 = 3BCD C
 220 = DC4F A | 860 = 8B58 8 | 1500 = 434D 3
 240 = 1794 5 | 880 = 5039 E | 1520 = 29AC C
 260 = B40E B | 900 = 5503 C | 1540 = B45D E
 280 = D6B5 D | 920 = 6A96 1 | 1560 = CEFE 8
 300 = A4CE 1 | 940 = E2BF 7 | 1580 = 7747 8
 320 = 9FEF A | 960 = 5F49 F | 1600 = B5FA 7
 340 =    0 A | 980 = 7376 E | 1620 = AC80 6
 360 = 88B5 4 |1000 = 4600 2 | 1640 = 9843 9
 380 = DAB1 7 |1020 = 48C0 1 | 1660 = 9719 0
 400 = C20D 3 |1040 =  E36 B | 1680 = 31D9 6
 420 = 16E9 6 |1060 = AB47 B | 1700 = 7290 1
 440 = F0CC 9 |1080 = F121 E | 1720 =  A10 C
 460 = E014 A |1100 = 1B07 9 | 1740 = BC63 0
 480 = FD2E F |1120 = 67F9 E | 1760 = A026 3
 500 = 4C1F F |1140 = EB29 6 | 1780 = E29E 6
 520 = BA15 0 |1160 = AD44 2 | 1800 = 5D78 F
 540 = 9719 9 |1180 = 9B24 F | 1820 = 1142 B
 560 = 1330 6 |1200 = 2591 B | 1840 = 8B58 9
 580 = 356B 7 |1220 = 2F49 F | 1860 = 2C83 E
 600 = B8FC 3 |1240 = 1279 A | 1880 = ED0F 0
 620 = 3C60 3 |1260 = 71E9 4 |
 640 = 8574 9 |1280 = BEA8 1 |
```

◀ From Page 27

example:

```
?&80=0:?&88=1
CALL Sort,N%,A$(1)
```

So there you have it. The only restriction is on the maximum number of items the routine can deal with, which is limited by the two byte signed counters *g* and *j* to 32,767 bytes of data, which allows us up to 8,190 integers or strings and 6,553 reals. This is academic for the standard BBC B, but could be exceeded by the Master using shadow screen.

● *Next month we'll look at a general purpose routine which can perform the three types of sort from one block of code. There'll also be a version that can rearrange a table of pointers to items within a data block rather than moving the items themselves – this is the only satisfactory way to deal with sorting a database file. See you then.*

## SORTING REAL ARRAYS

Real numbers are more correctly known as floating point variables. Each occupies five bytes, with the first – the exponent – defining the position of the decimal point, or more accurately the binary point, and the remaining four – the mantissa – is the number itself.

Unlike integers, the most significant byte comes first. The numbers are shifted left so that the most significant bit of the mantissa is always one except when the whole value is zero, when the most significant bit is zero. This normalising process is carried out on all real numbers by Basic as it stores them.

A further refinement is that Basic uses the most significant bit for the sign, changing it to zero for positive numbers. When manipulating the numbers for arithmetic operations Basic unpacks the one it is working on into extra bytes in a work area of memory and then restores the most significant bit to one. It is all this extra manipulation which makes real

## SORTING STRING ARRAYS

These would pose a massive problem if the array pointers referred directly to each element, since the elements can be of different lengths. Consequently each time an element was swapped it would be necessary to reallocate memory space and tidy up the store. This would not only slow the sort down considerably, but create a real programming headache.

Fortunately none of this is necessary. BBC Basic keeps track of the location of each string in a separate table of four byte pointers. It is addresses in this table which are swapped – not the strings themselves. This method can be used to sort large blocks of data quickly – we do not move the data in memory, only the contents of the pointer table, which can itself be an array. We will see how this can be used in database sorting next month.

The comparison of strings is considered in three ways. Each letter is compared, ending at the first mismatch, with a swap flagged if necessary. Ascending numerical order has the lowest number at the top of the list, so with strings we obtain alphabetical order. This is the usual way to sort names, so it suits our purpose.

If both strings are still equal when the end of one of them is reached, the longer string is swapped down the table. A third consideration is important when sorting lists of names. Lower case letters have a higher Ascii value than equivalent capitals, and this can cause problems unless all entries follow the same format – *Jim* will appear before *JOHN*. So there is an option to treat lower case letters the same as capitals by setting the "caps" flag at &88 to a non-zero value.

Null strings are moved to the bottom of the table in an ascending sort. This means that in a descending sort they come to the top. One way to avoid this if you are sorting a table with a lot of null strings in it is to do an ascending sort first. Next search for the first null string and only do the descending sort on the non-null section of the array.

```
   40 REM STRING ARRAYS
  140 DIMA$(1000)
  180 INPUT"How many strings to be sort
ed? "N%
  245 PRINT"Treat lower case as upper?
(Y/N) ";:REPEATA%=GETAND223:UNTILA%=ASC"
Y"ORA%=ASC"N"
  255 VDUA%:?caps=0:IFA%=ASC"Y" ?caps=1
  280 FORI%=1TON%:A$="":L%=RND(20)
  290 FORJ%=1TOL%:A$=A$+CHR$(RND(52)+64)
:NEXT:A$(I%)=A$:NEXT
  320 TIME=0:CALLSORT,N%,A$(1):T%=TIME
  340 REM FORI%=1TON%:P.A$(I%):N.
  370 IF?caps=1 GOTO460
  400 FORA%=1TON%-1:IF?dirn=0:IFA$(A%)>A
$(A%+1) PROCERROR
  420 IF?dirn=1:IFA$(A%)<A$(A%+1) PROCER
ROR
  665 jlen=&82:glen=&83
  670 jaddress=&84:gaddress=&86
  675 caps=&88:temp=&89
  820 LDAparams+6:CMP#&81:BEQgood
 1670 .link CLC:BCCcomeback
 1740 .asc LDY#3:LDA(gptr),Y:STAglen:LDA
(jptr),Y:STAjlen
 1760 BNEnotnull:ORAglen:BEQlink:BNEswap
it
 1780 .notnull LDAglen:BEQlink:LDY#1
 1800 .addrloop LDA(jptr),Y:STAjaddress,
Y
 1820 LDA(gptr),Y:STAgaddress,Y:DEY:BPLa
ddrloop:INY
 1840 .sloop LDA(gaddress),Y:LDXcaps:BEQ
nochange1
 1860 CMP#97:BCCnochange1:CMP#123:BCSnoc
hange1:AND#223
 1880 .nochange1 STAtemp:LDA(jaddress),Y
:LDXcaps:BEQnochange2
 1900 CMP#97:BCCnochange2:CMP#123:BCSnoc
hange2:AND#223
 1920 .nochange2 CMPtemp:BCClink:BNEswap
it
 1940 INY:CPYjlen:BEQlink:CPYglen:BNEslo
op
 1960 .swapit INCswapflag:BNElink
 1980 ]
 2000 NEXT
 2020 ENDPROC
```

Get it right!

```
 40 =    0 0 | 420 = B87E B | 1840 = 3520 E
140 = 19B6 6 | 665 = 87BB 4 | 1860 = C53F 7
180 = 7652 D | 670 = 1098 3 | 1880 = C139 1
245 = 70F6 4 | 675 = D490 4 | 1900 = 7001 2
255 = D6E4 0 | 820 = 178C 8 | 1920 = 2B5F A
280 = C8F9 5 |1670 =  60A D | 1940 = 9DB7 A
290 = B72C 0 |1740 = 8401 B | 1960 = FD19 9
320 = 74CC 1 |1760 = E926 6 | 1980 = 8B58 4
340 =    0 1 |1780 = 77A9 0 | 2000 = 2C83 1
370 = DD57 1 |1800 = 3AAC 1 | 2020 = ED0F 7
400 = 6C9A E |              |
```

number arithmetic so much slower than integer arithmetic.

To compare the numbers therefore, we proceed like this:

- Compare the signs and if different, swap as appropriate.
- If the signs are the same compare the exponents and swap as appropriate.
- If the exponents are the same, we compare the mantissae without the msb restored. We don't need the msb – it's like comparing 700088 with 700099 – the 7 doesn't affect the outcome.

If we did reset the msb we would then have to perform a separate test for zero. Since the numbers are unsigned, we need only compare each byte in turn, working from most to least significant, and flag a swap as required. When flagging the swap we must take into consideration whether the numbers are positive or negative – a large negative number must be sorted above a small negative number in an ascending sort. This is catered for in lines 2000 to 2040.

```
   40 REM REAL ARRAYS
  140 DIMA(1000)
  280 FORI%=2TON%STEP2:A(I%)=(RND(10000)
-5000)/RND(100):NEXT
  290 FORI%=1TON%STEP2:A(I%)=RND:NEXT:A(
RND(I%))=0
  320 TIME=0:CALLSORT,N%,A(1):T%=TIME
  340 REM F.I%=1TON%:P.A(I%):N.
  400 FORA%=1TON%-1:IF?dirn=0:IFA(A%)>A(
A%+1) PROCERROR
  420 IF?dirn=1:IFA(A%)<A(A%+1) PROCERRO
R
  670 gexp=&8A:jsign=&8B:gmanthi=&8C
  820 LDAparams+6:CMP#5:BEQgood
 1270 CLC:LDAk:ADCj:STAj:LDAk+1:ADCj+1:S
TAj+1
 1290 CLC:LDAgap:ADCg:STAg:LDAgap+1:ADCg
+1:STAg+1
 1440 .comeback LDAswapflag:BEQnext:LDY#
4
 1500 SEC:LDAj:SBC#5:STAj:LDAj+1:SBC#0:S
TAj+1
 1740 .asc INY
 1760 LDA(jptr),Y:AND#&80:STAjsign
 1780 LDA(gptr),Y:AND#&80:DEY
 1800 CMPjsign:BEQcompexp:BCSswap
 1820 .link CLC:BCCcomeback
 1840 .compexp
 1860 LDA(jptr),Y:CMP(gptr),Y:BEQcompman
t:BNEnot
 1880 .swap INCswapflag:BNElink
 1900 .compmant INY:LDA(gptr),Y:AND#&7F:
STAgmanthi
 1920 LDA(jptr),Y:AND#&7F:CMPgmanthi:BNE
not
 1940 LDX#3
 1960 .rloop2 INY:LDA(jptr),Y:CMP(gptr),
Y:BNEnot
 1980 DEX:BNErloop2:BEQlink
 2000 .not BCSJsig0
 2020 .Jsig80 BITjsign:BMIswap:BPLlink
 2040 .Jsig0 BITjsign:BPLswap:BMIlink
 2060 ]
 2080 NEXT
 2100 ENDPROC
```

**Get it right!**

```
  40 =    0 0 | 1290 = 1315 D | 1900 = C1A6 B
 140 =  A1E E | 1440 = 9A85 4 | 1920 = 8789 9
 280 = CF61 6 | 1500 = EF2C C | 1940 = 9CC4 D
 290 = 2BA9 5 | 1740 = C31D B | 1960 = A620 5
 320 = C3FF F | 1760 = 523D E | 1980 = 930B E
 340 =    0 F | 1780 = E051 A | 2000 = 57EC C
 400 = 5CEE C | 1800 = 74D3 5 | 2020 = F218 6
 420 = 7604 5 | 1820 =  60A D | 2040 = E019 1
 670 = FA99 2 | 1840 = E1D5 7 | 2060 = 8B58 3
 820 = 83A2 1 | 1860 = AD34 F | 2080 = 2C83 E
1270 = 8E14 B | 1880 = 6505 A | 2100 = ED0F E
```

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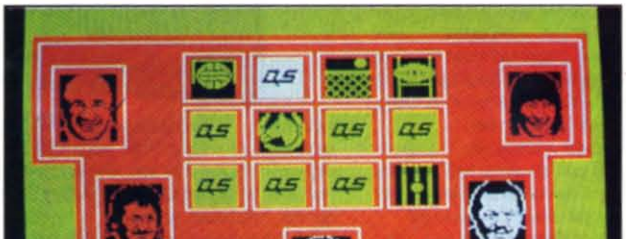
# SOFTWARE SCENE

## Question of Sport ... and you may confer

*Price: £12.95 (tape), £14.95 (5.25in disc), £19.95 (3.5in disc)*
*Supplier: Superior Software, Regent House, Skinner Lane, Leeds LS7 1AX.*
*Tel: 0532 459453*



WHEN you run this program, brought to you courtesy of Elite systems, you are greeted by the lifelike sketches of David, Bill and Ian and take the part of one of the latter two. Next you choose your specialist subject or opt for minor sports and choose two team members from a board of graphic interpretations of digitised faces.

As in the original TV game, there are six rounds: Picture Board, Mystery Personality, Home or Away, What Happened Next, Quickfire and then back to the Picture Board to round off.

I expected the Picture Board to be similar to the television, but instead when you select one square it flips over to reveal an icon representing a sport.

After this a stream of text, moving through a speech bubble over Mr. Coleman's head, asks you a multiple-choice question related to the icon. Get it wrong or run out of time and it is passed over to the opposition. If they also get it wrong you still aren't told the correct answer. Fair enough, as you might get asked this again, but very irritating if you were sure you were right.

The Mystery Personality section is the same in name only. You are given three statements about a person. Three points are for getting it on the first try, two on the second and so on. If you answer incorrectly it's passed to the other team regardless of whether you have more clues to go.

The third round tests everyone's specialist knowledge in Home or Away and the fourth gives you a description of the circumstances and you must reveal what happened next.

The penultimate round is the Quickfire with nine questions to answer in the time limit. The first person to select an answer stops the clock and, as in all the sections, you get two points for a correct answer. One is awarded if you correctly answer a question which is passed over to you from the other team.

Finally it is back to the Picture Board to finish the remaining squares.

If you like testing your own knowledge and enjoy all sorts of sport you will like this one. Possibly one for all the family.

**Jo Giles**

| | |
|---|---|
| ***Sound*** | ***3*** |
| ***Graphics*** | ***8*** |
| ***Playability*** | ***9*** |
| ***Value for money*** | ***8*** |
| ***Overall*** | ***8*** |

## Archimedes Repton 3 ... Oh no, not again

*Price: £9.95 (tape) £11.95 (disc)*
*Supplier: Superior Software, Regent House, Skinner Lane, Leeds LS7 1AX.*
*Tel: 0532 459453*

SO you bought your Archimedes and heaved a sigh of relief, thinking you'll never need to play Repton again. But what's this? Your little green friend has moved up market too, and here he is in all his glory.

So what's new in the Archimedes version? To be honest, not much. On the disc you get all the original Repton 3, Life of Repton, Repton through Time and Around the World in 40 screens. This makes a grand total of 144 screens on which the passwords and edit codes are different to the original version.

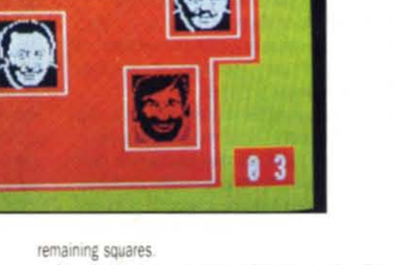
The game runs about 25 per cent faster and the action is much smoother, but the apparent screen resolution is identical, as are the colours. In fact the horizontal resolution is twice as good – pixel size halved – but the screens are exact copies, so that's irrelevant.

You get four new tunes instead of one, all of which are quite competently produced using the built-in sounds, but the third seems to tail off at the end as if it wasn't finished – which is a shame because it's my favourite.

The screen editor is a slight improvement on the original, with better mouse handling and pop-up menus. But there are still no useful features like mirror and flip in the character designer, which means you have to design the full set of Repton figures individually – even when they are exact mirrors of others.

The full 16 colours are available and definable, but some are limited for system use. The increased screen resolution makes detailed design much easier as you can see from the new Reptina shown in the picture.

You still can't paint on to the map screen and have to click the mouse for every position. In addition the handling of teleports is very tricky. On my first map design I lost the first three accidentally and couldn't get them back. However the screen designer no longer discourages use as it did before.



This is a reasonable package but nothing to get enthusiastic about. Superior intended it to be a conversion from the original and that is what it is. But the time would surely have been better spent producing something new.

**Petra Galloway**

| | |
|---|---|
| ***Sound*** | ***9*** |
| ***Graphics*** | ***7*** |
| ***Playability*** | ***9*** |
| ***Value for money*** | ***8*** |
| ***Overall*** | ***8*** |

## The Last Ninja ... cut above the average

*Price: £9.95 (tape) £11.95 (disc)*
*Supplier: Superior Software, Regent House, Skinner Lane, Leeds LS7 1AX.*
*Tel: 0532 459453*

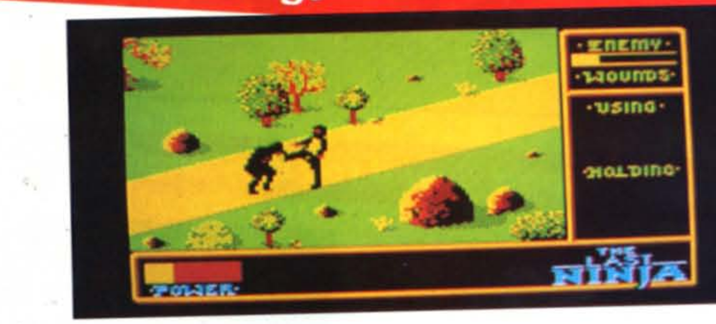
THE Last Ninja is a story of jealousy, power, and revenge – of good versus evil and one man's struggle against overwhelming odds. Oh yes, I almost forgot, it is easily the best martial arts-cum-adventure game on the market.

For many years the evil Shogun had envied the closely guarded skills and secrets of the Ninja. Executing a dastardly plot he slaughtered the Ninja community on its once-a-decade visit to the sacred island of Lin Fen.

Unbeknown to the Shogun a solitary Ninja – Armakuni – had been left behind to guard the shrine, feed the cat and perform other such tasks. Now he has sworn to avenge the deaths of his comrades and re-build the Ninja empire.

You play Armakuni as he begins his assault on the island of Lin Fen. There are six separate locations on the island and you must kill every guard and collect all available objects on each level before advancing to the next.

Control is achieved using the keyboard only – this may sound restrictive for a martial arts game, but it works well in practice. In addition to the direction keys there are also three separate jump buttons – each providing increasing distance. As if to demonstrate his supreme athleticism, Armakuni insists upon performing a forward somersault when prompted to jump.



Level one is set in the wilderness, a barren wasteland of rocks, bushes and a thoughtfully provided path for you to walk on, but it is patrolled by the Shogun's warriors. Inexperienced in the way of the Ninja, they do not yet possess your skills, but they are still capable of giving you a good thumping if you become careless.

Initially unarmed, you must pummel your opponents using only fists and feet. Things become a little easier as you round the first corner and find an abandoned sword – the first of five weapons available on level one. By pressing the spacebar you can quickly switch between any of the weapons currently in your possession. The instructions advise you to use the same weapon as your opponent, but I found the sword to be effective against most adversaries.

Unlike many games, you are not restricted to travelling in one direction, but are free to wander where you wish within the confines of the location. Another very welcome feature is the way that the guards stay dead once you have dealt with them – there is nothing worse than returning to a location and having to fight the same guard that you killed five minutes earlier.

Once you have mastered the human opponents, why not try your hand with the flaming dragon that guards the exit to level two?

The Last Ninja is quite a departure from programmer Peter Scott's traditional style – the prolific author of countless cute platform games has really come up with the goods this time. Ninja is fast, furious and totally addictive.

**Jon Revis**

| | |
|---|---|
| ***Sound*** | ***8*** |
| ***Graphics*** | ***8*** |
| ***Playability*** | ***9*** |
| ***Value for money*** | ***9*** |
| ***Overall*** | ***9*** |

---

## Startrader ... capitalists in space

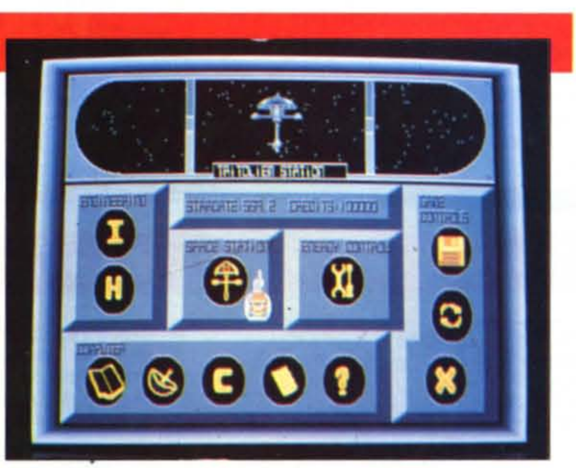
*Price: £17.95 (mail order only)*
*Supplier: Gem Electronics, 17 Tandragee Road, Portadown, Craigavon BT62 3DQ.*

IT is easy to believe that there is only one universe as you hold that 3.5in disc in your hand. However, beings in another dimension would be inclined to argue the point. And when you boot the disc you are informed that a universe is being created for you and suddenly you find yourself in a totally capitalist society.

Everything costs credits, which you can only gain by smart interplanetary trading, and you must seek the elusive nine segment de-activation code for an Armageddon Device set by the evil Kargans. Not only is this timed to destroy the universe at stardate 999.9, but these creatures are not beyond a little ambushing as you wander round. The storyline comes with the disc and some poorly laid out instructions.

Almost all the game control is via the mouse through an attractive set of full screen menus. The icons are colourful and reasonably obvious. For docking your ship Gem has sensibly used left and right buttons for attitude control rather than the mouse proper – after Lander/Zarch this is greatly appreciated. Yet for some reason, keys are used in combat when the mouse would have been more obvious.

Impending battles set off a warning system as you are told to set your weapons system. Not expecting my micro to talk, this rather threw me the first time, so that I had only enough time to desperately see off my attackers with zero energy phasers and no shields.



though this is not exactly fair as it is much larger, with more than 100 galaxies to hyperdrive through, each with about five visitable planets, and it makes no pretence to 3D graphics.

There is little actual flying, as your course is plotted between planets, leaving you with the docking which, if you don't do it properly, results in damage to your hull. You can also manoeuvre in battles, though this is a little sluggish. You are flying a large cargo vessel whereas your opponents are various classes of fighters, so perhaps this is logical. Should you survive you can always upgrade your engines.

If you should decide to transport to the planet's surface you may be disappointed – indeed I would have happily sacrificed a few star systems for the benefit of better planetary graphics.

Overall, Startrader is a well thought out strategy game though the combat section could have been tighter. I was impressed that the disc was not copy protected and that you are encouraged to make yourself a back-up. Incidentally, it might be paranoia on my part, but after ending badly several times, I found the closing message distinctly smug.

**Terry Blunt**

| | |
|---|---|
| ***Sound*** | ***8*** |
| ***Graphics*** | ***7*** |
| ***Playability*** | ***7*** |
| ***Presentation*** | ***5*** |
| ***Value for money*** | ***9*** |
| ***Overall*** | ***7*** |

# Pac-mania ... out for the chomp

*Price: £19.95*
*Supplier: Grandslam Entertainments, 12-18 Paul Street,*
*London EC2A 4JS*
*Tel: 01-247 6484*

WHEN Pac-mania landed in my lap I thought *Oh no, not another Pac-man!*. Well it isn't, and I'm a converted Pac-maniac.

With all the versions of the original game around – including Snapper, Munchy man and our very own Hac-man – I'm sure you're all familiar with the little chomper, power pills and the ghosts.

In this new game you not only get a 3D view – which doesn't cover the whole screen – but four different worlds to chomp your way through.

When you boot the disc you get a fairly dull set of instructions and from there you go to screen selection, which has pictorial representations of Block Town, Pac-man's Park, Sandbox Land and Jungly Steps – theoretically graded in order of difficulty.

The default controls are Z,X,O,K and spacebar for jump. You can define your own keys but although unusual I found the default ones quite comfortable and convenient. All extra options such as pause, sound and so on are controlled by Shifted keys, so you won't press them accidentally.

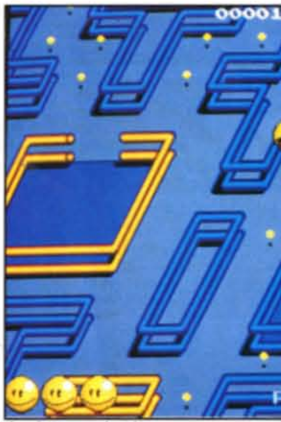
Selecting Block Town takes you to an intermediate screen which has Pac-man being chased across the screen by the ghosts, now named Inky, Pinky, Blinky, Clyde, Sue and Funky. Then you get to the game proper.

You start to munch your way round the maze, composed of Lego and Duplo blocks and accompanied by a jolly tune using excellent sounds, chomping at the little yellow spots while the ghosts wander round randomly matching your speed. Scattered to the four corners of the maze are the power pills which, when chomped, change all the ghosts blue and reduce their speed for about 15 seconds.

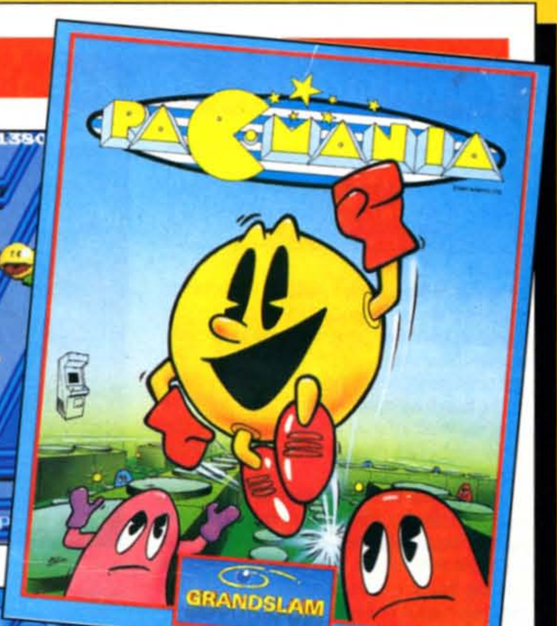
In this time you can chomp them – the points you get double for each subsequent ghost chomped, up to a maximum of about 7000. The ghosts' eyes then wander around the maze rapidly until they reach their base, at which point they re-constitute.

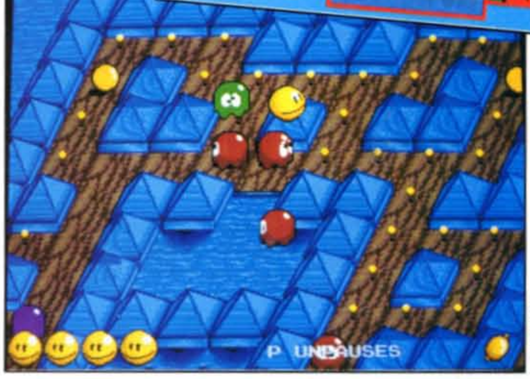
Occasionally a piece of fruit or a sweet appears at a point on the maze and will give you a score if you chomp it – but it only lasts for a while. If you're very lucky a small green sphere appears. When munched this gives you double speed for a while and can really help in cleaning up the maze and getting high scores. Also short duration turn-blue pills occasionally appear but they aren't very useful.

If you are being chased by a persistent ghost it is possible to reverse direction and jump over it. You can see its eyes look up as you go over it – but watch out. Don't jump just before a junction, as this is where ghosts change direction and it'll stay on your tail.



*Jumping over a ghost in Pac-Man Park*





*Bouncing ahead in Sandbox Land*

Once Block Town has been cleared you move to Pac-man Park via a little theatrical interlude. The park looks like the classic original as seen from the side – including the route off screen from the right to the left, except the ghosts can use it, too. This screen has a different tune, excellently rendered, and is much more difficult to complete than Block Town.

Completing it the first time results in you having to do it again with different colours, but now the purple ghosts move faster than you and are virtually unshakeable. The only way is to get them on a straight with no junction near and do the reverse jump.

Sandbox Land is reached via an interlude screen which informs you that green ghosts can now jump too. This seems the easiest screen. Not only are there so many twists and turns that it's easy to foil pursuing ghosts, but if you get a go-faster pill you can wipe the floor with your opponents and get massive scores.

You do this screen twice – the purple ghosts go faster on the second one – then move to Jungly Steps after seeing a nightmare where Pac-man is chased by a giant ghost at least four times normal size. After getting over your fear of falling – Pac-man is moving along logs suspended above the jungle floor – you can zoom around this new screen fairly successfully on the first round. The impression of going up and down slopes is quite uncanny.

On the second round the ghosts are faster again, but it's still easier than Block Town. From here you go back to the start with the whole game running twice as fast, with jumping ghosts and superfast ones.

This game is an example of what really professional games companies can produce and it is superb. Buy it.

**Lazarus**

| | |
|---|---|
| ***Sound*** | ***9*** |
| ***Graphics*** | ***9*** |
| ***Playability*** | ***9*** |
| ***Value for money*** | ***8*** |
| ***Overall*** | ***9*** |

# Repton Infinity ... new game – old face

*Price: £14.95*
*Supplier: Superior Software, Regent House, Skinner Lane, Leeds LS7 1AX.*
*Tel: 0532 459453*

IT is unusual to find a games compilation that includes a game creator. Very handy – you don't have to be at the mercy of somebody else's warped imagination when you can be at the mercy of your own.

But before lashing out with the games creator you should play the four games provided. Each is similar in that the screen scrolls left, right, up and down, as the respective heroes make their way through a colourful maze of intricate puzzledom.

In the first, **Repton 3 – Take 2**, you amass as many points as possible by collecting crowns and diamonds and killing monsters. The usual eggs are scattered about ready to hatch into irksome green monsters. More difficult to shake off are large blue floating asterisks, or spirits, which have to be guided into cages where they metamorphose into diamonds – much more congenial.

Teleportation can speed things up a bit, but it is advisable not to use this facility too soon as you tend to find yourself in dead ends or spirit dens with no apparent way out.

**Repton 4** is the second offering and here your mission is to amass banknotes and jewels and try to kill any ghouls that pass your way by strategic dropping of rocks. Magiblocks when pushed together to form a threesome turn into diamonds, which earn you more points. One of the more delightful features was the way objects can be duplicated by using the photocopiers you encounter.

The third game – **Robbo** – is graphically a little more stylish and the gameplay is distinctly more demanding – Repton's spatial puzzles supplemented by a number of tasks like illuminating a light bulb, putting a can into a fridge or mowing a section of grass.

The final game is **Trakker** which presents a bizarre scenario with you taking the part of a JAFFA – Jagga Annihilation and Fruit Flinging Associates – driver. Indeed there is a great deal of squidging and squelching as you drive your bulldozer over any tomatoes which get in your way. Bananas, as you well know, are lethal weapons and can be used for crushing Jaggas. Approach from behind, otherwise the Jagga will transform itself into a green tubular spider.

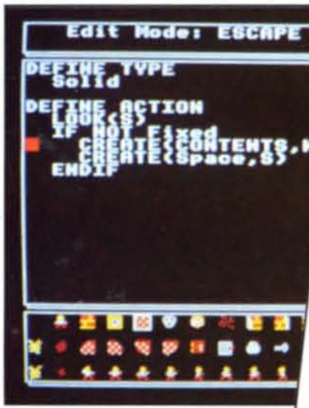
You are accompanied by Kevin – a bit of a dynamo when it comes to dynamite – and you will find the game can be quite explosive by placing him near sticks and then driving over a detonator.

The real joy of the package lies, not in the game itself, but in what the game creator enables you to do – apart from design the four other games on the disc. True, it confines you to Repton-type adventures, but there is a great deal of room for inventiveness.

The package takes out all the hard work that normally goes into the creation of a game and is a far cry from the editor usually supplied with the Repton games.

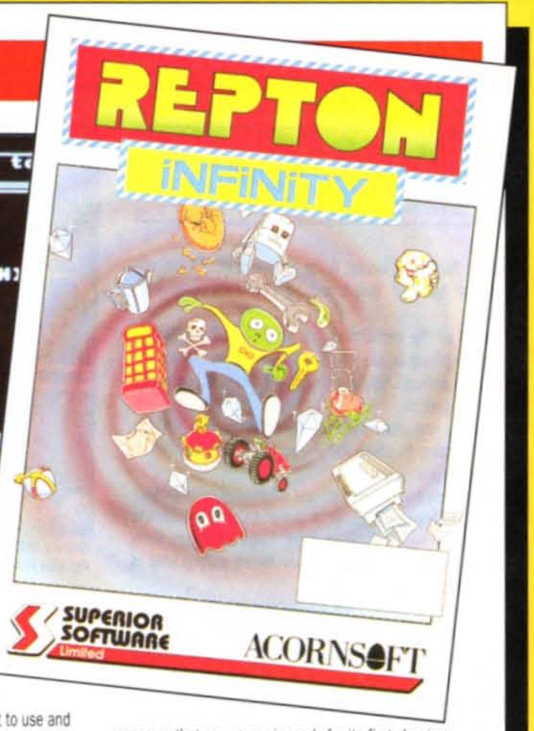
The creator is split into four distinct parts. Three are editors which enable you to work on the different elements of a particular game and the other links them to form a coherent game.

The first stage is the screen designer, and here you can create a landscape for your sprites to inhabit. Anyone who has used a graphics utility will find this extremely easy to handle. Various blocks of pattern and colour displayed at the bottom of the screen can be used to fill areas of the main screen.



```
Edit Mode: ESCAPE t
DEFINE TYPE
  Solid

DEFINE ACTION
  LOOK(S)
  IF NOT Fixed
    CREATE(CONTENTS,N)
    CREATE(Space,S)
  ENDIF
```



Similarly, you can go to the second of the programs and design your own sprites pixel by pixel. It's simply a matter of choosing an existing character and modifying it or creating something new.

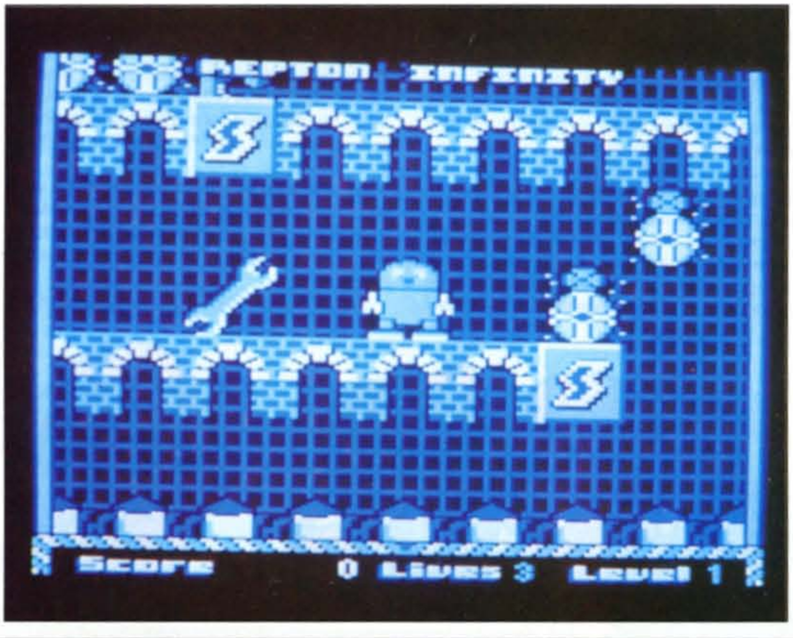
The third program is perhaps the most difficult to use and a careful reading of the manual is necessary. The programming system which has been developed is called Reptol and is similar to Basic. However, the commands have been greatly simplified, so that only the essential ones are given and you do not need any prior knowledge of programming. Here you can bring your game to life, animate your sprites, randomise movement, create objects and produce sound effects.

Once all the hard work has been done, the final step is to link the files you have created using the File Linker facility. This is simply a matter of keying in the appropriate file names so that your game is ready for its first showing.

Repton Infinity would be excellent value for games alone, but you can have much more fun by experimenting with the game creator. You won't be disappointed.

**Tony Flanagan**

***Sound*** ........ *9*
***Graphics*** ........ *8*
***Playability*** ........ *9*
***Value for money*** ........ *10*
***Overall*** ........ *9*



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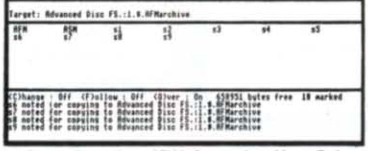

*Screen picture shows AFM in Copy mode on Master Turbo*

AFM follows the PRES 'Master Plan' of upwards compatibility – it runs on Electron, BBC B, B+, B+128, Master 128 and Compact, with Second/Co-processors and Acorn-compatibile versions of DFS & ADFS.

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**DELETE** – allows files to be marked and then deleted with one keystroke.

**RENAME** – allows one or more files to be marked and then renamed using a wildcarded name, ie one which varies with each file renamed. Thus you could rename s1, s2 and s3 to be s1_old, s2_old, and s3_old in one operation... and that's only the beginning! As well as using the whole of the original name you can also pick out individual characters to form part of the new name.

**COPY** – the strongest feature of AFM. It is a two stage copy routine. With both source and target directories shown on screen the files to be copied are marked. Once all the files have been marked copying is started and the computer can be left to get on with it!
Large files can be split across several disks, and re-combined.

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# Sigmasheet's the big one

## An investigation of the record-breaking spreadsheet by Ian Whitmore

*Product: Sigmasheet*
*Price: £69.95*
*Supplier: Minerva Systems, 69 Sidwell Street, Exeter, Devon EX4 6PH*
*Tel: 0392 37756*

**WITH Sigmasheet Minerva Software has created a great example of Archimedes software. This has to be one of the fastest and largest spreadsheets available for any micro. It is supplied on one protected disc with a manual 76 pages long. The instructions suggest making a copy which will be the working disc, but you have to keep the original handy as it must be inserted briefly when instructed every time you start up.**

Hard disc installation is just as easy, but you still need the original every time to get going.

You are presented initially with a title program (Figure I) which, as well as letting you load Sigmasheet itself, provides an information system for updates to the software not shown in the manual and two import/export utilities. When you select Sigmasheet, the software checks for the original disc in drive 0 and providing it is there Sigmasheet runs presenting you with a blank spreadsheet which can extend from A1 to AMI16383 – yes that's 16,759,809 cells (see Figure II).

In reality the usable size is limited by available memory, giving some 25,000 – 160x160 – cells on an A310 and 170,000 – 410x410 – on a A440. Above the sheet is an information and input area, displaying the contents of the currently selected cell, various cell parameters, an error line, cursor movement and recalculation modes, the number of bytes free and the time.

Input is particularly easy as Sigmasheet automatically recognises numeric data, labels and formulae on entry – defaulting to label if there is text which it cannot recognise as a formula. Entering a + as the first character forces a formula or value while " forces label entry.

Using < or > left/right justifies the cell while ↑ centres it, input is displayed on the input line until Return is pressed whereupon it is transferred to the cell. Although there were occasional problems with earlier versions, I found it impossible to enter data faster than the machine can deal with it.

There is one trap however – when entry forces the display to move across to the next screen there is a short pause while the screen is redrawn. During this time data input is completely suspended – any key presses ignored – and you can get confused.

Editing commands are the same as those used in the Wimp environment so Control+U deletes the whole input line and so on. Text extending over the boundary of a cell will be displayed in full as long as the cells it lies over are blank which makes labelling of columns much easier for tables. Commands are entered in a number of ways:

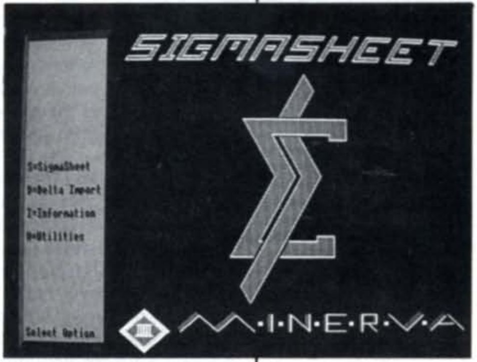

*Figure I: The title screen*

- Clicking the Menu button reveals the command menu – Figure III – from which individual commands are selected by using the pointer or single letter key presses.
- You can use Control plus a single letter.
- Or / and the same single letter on the input line gives direct access to the command in a similar manner to Inter-Sheet.

All the usual spreadsheet commands are supported such as load, save, insert, copy, delete, print, go to cell and column width. The display can be in 80 or 132 column modes – later versions will include a driver for multi-sync monitor modes. Also from this menu star commands and an on-screen calculator are accessible. The Alt key is used with a second key to alter column width, blank the current cell, force a recalculation or move the sheet one column width to right or left.

Although rows and columns are referred to by numbers and letters, you can label each one with a title of up to 60 characters. Reference to cells can then be either by number and letter in the usual way – J12 – or by a title, like Joseph Maths. Unfortunately Sigmasheet does not allow you to select cells for copying using the mouse or cursor, you have to refer to cells by number and letter and/or title.

*Figure II: A portion of the 16,759,809 cells*

However it will accept both colon and double full stop separators between cell references, so conforming with Inter-Sheet and Lotus 1-2-3 – the most popular PC spreadsheet. Column widths can be individually set and each cell indepen-

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◀ From Page 37

dently formatted. What looks like a complex formula in square brackets following the cell reference is that cell's format. Numeric format may be general, exponential or fixed – a fixed number of decimal places – while the cell can be protected or writeable.

Negatives may be displayed with minus signs, in red, with brackets or by DR. Currency symbols, which are user definable, percentages, date and time formats are all available. Setting format from the command menu allows cells, columns, rows or the whole sheet to be set.

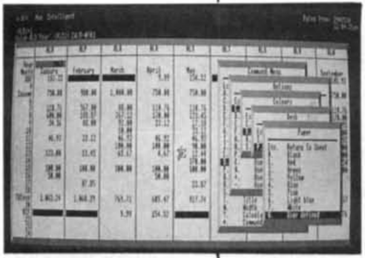

Figure III: The command menu

An option sub-menu selects various display parameters such as colours, column gap, user currency formats, printer options and cell or input line editing. At the top of the screen two further options – both selectable via the main menu – are the autocursor movement and recalculation modes. You can choose cursor movement in any direction or not at all after input into a cell.

Although Sigmasheet is very fast, when entering data to a large spreadsheet there is a significant delay while the whole sheet is recalculated after every input. Thus Minerva has allowed auto-recalculation to be switched off. If you then want to recalculate you must press Alt+R.

Most spreadsheets allow only column by column or row by row recalculation, but Sigmasheet also has an intelligent recalculation mode. This checks cell to cell references in formulae, working back to the original formula from the most distantly referred cell containing data. Thus it avoids the dreaded *Forward Reference* error. As this could give rise to circular calculations when the last cell refers back to the first, Sigmasheet checks for circular reference at the time formulae are input.

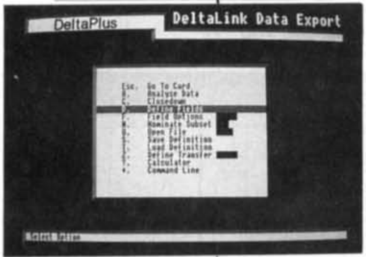

Figure IV: Importing database information

As each sheet is memory based, Sigmasheet demonstrates its speed during re-calculation – 200 times faster than Inter-Sheet and 1,600 times faster than Viewsheet, although in my tests it's not as fast as Pipedream. However it demonstrates great mathematical accuracy and is written to use the floating point emulator, or when it becomes available, the maths co-processor – Archimedes 400 series only.

Table I gives a list of operators and functions. Strangely missing are financial functions, which you might have expected to see on an advanced system such as this.

Printouts can be formatted automatically if that option is set. This allows Sigmasheet to print in condensed mode to put as much of a sheet on paper as possible. Only normal across the page printing is supported, but a large sheet is intelligently broken up when printed to allow you to do a manual cut and paste reassembly of the whole sheet. Once again some earlier versions did not always get this right.

From the printer menu you can redefine various codes to match your own device. Three fonts and two user money formats can be selected, form feed and reset codes chosen. The user money format allows the printer to print the correct symbol for, say, Yen where you have used that currency in the onscreen sheet. Once selected these options can be saved as a printer driver for future reloading.

| **Type** | **Operation or function** |
|---|---|
| Arithmetic | + – * / ^ % MOD |
| Relational | < <= = > >= <> |
| Logical | OR AND NOT |
| Trigonometric | ACS ASN ATN COS<br>DEG RAD SIN TAN |
| General | ABS ALG EXP INT<br>LN LOG PI ROUND<br>SGN SQR TRUNC |
| Data Manipulation | AVG CHOOSE COL<br>COUNT IF LOOKUP<br>MAX MIN ROW SUM<br>SUMSQ |
| Time and date | DATE DAY HOUR<br>MINUTE MONTH<br>NOW SECOND<br>TIME WEEKDAY<br>YEAR |

In addition some statistical functions which would allow you to build up more complex formulae are supported.

*Table I: Operations and functions supported by Sigmasheet*

The function keys are unused by Sigmasheet so you can use them at will, programming them in the usual way with *KEYn. This is particularly useful for some of the more complex commands. For instance you could use:

```
*KEY1 /F C #F2(R,W
```

to reformat the current cell to #, fixed format with two decimal places, negatives indicated by brackets and highlighted in red, thousands indicated by commas and writeable.

You can select two options from the original screen to import or export data. Deltalink – Figure IV – has been written to allow access to data held in Minerva's Deltaplus database system and enables quite complex data extraction. However it is difficult to understand the instructions for this in the manual, and there have obviously been some changes since that part was written.

Importing data from other spreadsheets is the province of the Utilities option. Sigmasheet can accept data from Lotus, Viewsheet and Inter-Sheet. In addition it will also attempt to import any Ascii file and comma separated files. I successfully input files in Ascii, comma separated and Inter-Sheet formats.

In general Sigmasheet is very good, although there are a number of niggles which could be improved particularly if you have moved from another spreadsheet and may miss facilities available previously. However you will be especially impressed by the size, speed and the intelligent recalculation.

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# Squaring up to windows

### Ken Down concludes his look at menus and starts peering through windows

> When we set up a menu we are in effect setting up a special type of window

**MOST people who play around with the Archimedes' Wimp system very quickly discover the windows lift and shift feature. That is, if you position the pointer in the window's title area and hold down the mouse's left-hand Select button you can move the window to anywhere on the screen. No doubt you have tried it with the menus that were created in the first article of this series.**

Sure enough, a rectangle of dotted lines appears and followed the mouse pointer around the screen. The disappointment comes when you release Select: Instead of the menu appearing in the new position it stays solidly where it was and the dotted rectangle disappears.

The good news is that there is nothing wrong with the program you typed in – and the better news is that we are going to rectify the problem right away.

When we release Select the Wimp–Poll routine returns a code of 2, which is the request to open a window. In response we need to call the *Wimp–OpenWindow* routine. If you have used the disc filing system on your BBC Micro for anything other than loading games you will be familiar with the concept of opening and closing files. You would have lines like these:

```
f%=OPENUP"Filename"
INPUT#f%,data$
CLOSE#f%
```

The OPENUP command returned a value which is called the handle – a unique number used to identify the open file. You could have several open at once, each distinguished by its own handle. When you used INPUT#, PRINT#, BGET#, BPUT# – or any file related command – the value of the variable that follows tells the filing system which particular file was to be read from or written to.

The Archimedes' windows must be opened and closed in a similar way and while they are open each is identified by its own handle.

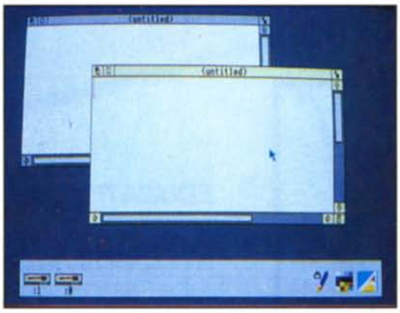
The poll routine that returns the code of 2 also sets up the memory block *poll%* to the correct format for opening a window, so it would be sufficient to respond to the call immediately with the statement:

```
SYS"Wimp_OpenWindow",0,poll%
```

However the call to open a window can result not only from lift and shift operations, but also from windows changing in size or being otherwise altered. We therefore need a general purpose routine:

```
400 DEFPROCopenwindow(handle%,mem%)
410 IF mem%=block% !mem%=handle%:SYS"Wimp_Get
WindowState",0,mem%
420 SYS"Wimp_OpenWindow",0,mem%:ENDPROC
```

The variable *mem%* signals whether or not the window has been moved. If *mem%* is the same as *block%* it has not, so we ask the Wimp to set up the parameter block for us with the call to *Wimp–GetWindowState*. In either case we call the Wimp



*Windows on screen*

routine *Wimp–OpenWindow* with register one containing the address of the parameter block.

We now need to tell the program to use this routine when the required code is returned by the polling routine. We have to insert a line in PROCaction.

```
240 WHEN2:PROCopenwindow(!poll%,poll%)
```

Seeing that we have a procedure to open windows, it is obvious that we will need one to close them. At the moment we don't have a use for it – but we will as soon as we start using real windows.

```
1100 DEFPROCclosewindow(handle%)
1110 !block%=handle%:SYS"Wimp_CloseWindow",0,
block%
1130 ENDPROC
```

The procedure is extremely simple: All we do is set the first four bytes of an area of memory to the window handle, and then call the routine *Wimp–CloseWindow*.

## Real windows

When we set up a menu we are in effect setting up a special type of window, one whose format the micro already knows about. As you are aware from using the DeskTop program, there are other types – for example the ones with scroll bars. When we want one of these we have to tell the Wimp about the desired format. We have to decide what colours we want, whether we have two scroll bars or not, and above all, how big the window is.

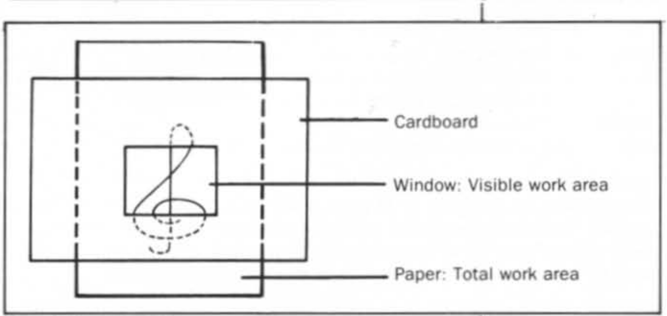
There are two aspects to a window's size. The most obvious is what we shall call the visible work area – VWA – which is what you actually see on the screen. You can enlarge it up to almost full screen size or reduce it to a tiny square in one corner. The VWA however is merely a window on to a larger area which can be scrolled into view by means of the scroll bars – we're going to call this the total work area, or TWA.

If you are trying to follow these articles in the Programmer's Reference Manual you will find it also uses the term visible work area for what is visible on the screen. However it calls the TWA the work area extent, a term which conjures up no picture at all. So we'll stick with VWA and TWA.

In case you are still confused, here's a concrete example. Imagine that you are working on a piece of paper – writing on it, drawing on it, erasing from it – and a fixed piece of cardboard with a rectangular hole covers it. When you have filled the area visible under the hole you have to move the paper sideways or up and down in order to reach a fresh area. Figure I shows the general idea.

The hole in the cardboard represents the visible work area and the paper is our total work area. Whatever the size of paper – A4, A5, A3 – the area visible through the hole in the cardboard remains the same.

So what we need is a function that will give all the necessary informaton to the Wimp Manager and will return a file handle:



*The window concept*

```
500 DEFFNcreatewindow(title$,flag%,fgcol%,bgcol%,twatx%,twaty%,vwab
x%,vwaby%,vwatx%,vwaty%,nicons%)
510 LOCALhandle%
520 !block%=vwabx%:block%!4=vwaby%:block%!8=vwatx%:block%!12=vwaty%
530 block%!16=0:block%!20=twaty%:block%!24=-1:block%!28=flag%
540 block%?32=12:block%?33=14:block%?34=fgcol%:block%?35=bgcol%
550 block%?36=13:block%?37=14:block%?38=1:block%?39=0
560 block%!40=0:block%!44=0:block%!48=twatx%:block%!52=twaty%
570 block%!56=&2D:block%!60=&3000:block%!64=0:block%!68=0
580 $(block%+72)=LEFT$(title$,11):block%!84=nicons%
590 SYS"Wimp_CreateWindow",0,block%TOhandle%:=handle%
```

Every window has a title bar which contains a string, here called *title$*. Of course this can be null – "" – but that is up to you. The contents of

**Turn to Page 42 ▶**

## Multitasking

Converting a Wimp-based program to operate in the multitasking environment is simplicity itself. First, two don'ts:

- ● Don't clear screen, change mode or alter the palette.
- ● Don't use the system sprite area – use your own.

To tell the Wimp that you are a new task you must modify the initialistation command to:

```
SYS "Wimp_Initialise",200,&4B534154,name$
```

The hexadecimal number is Ascii for the word TASK and *name$* is what you want your program to be known as – 200 stands for the latest Wimp version number, 2.00.

In your Wimp-poll routine add a new action line:

```
WHEN 17,18: PROCmessage(q%)
```

Where *q%* is the address of the poll routine returned data block. Then include the new procedure:

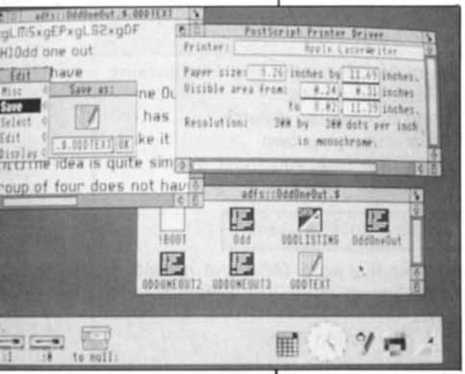
```
DEF PROCmessage(q%)
IF q%!16=0 THEN quit=TRUE
ENDPROC
```

This assumes that setting *quit* to true will cause your program to exit properly. The task manager will, under some circumstances, order a task – your program – to close down and this is needed to accept that order.

As it stands your program will grab all available ram so you need to tell the Wimp to only allocate a given amount. You do this with a !Run file which should look like this:

```
Wimpslot -min 64k -max
128k
RUN my_program
```

The Wimpslot command tells the Wimp how much space to allocate to the next task initialises. So by double clicking the !Run file you can set up and invoke your program.



Printer: Apple LaserWriter

Paper size: 8.26 inches by 11.69 inches.

Visible area from: 0.24, 0.31 inches

to 8.02, 11.39 inches.

Resolution: 300 by 300 dots per inch

in monochrome.

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the flag word are described below, as well as a short utility procedure to calculate it. Foreground and background colours – *fgcol%* and *bgcol%* – refer to the visible work area. For the sake of consistency and simplicity the border colours are kept the same.

The total work area top x and y coordinates are called *twatx%* and *twaty%* and in the same way *vwabx%* and *vwaby%* refer to the visible work area bottom x and y coordinates – we assume the bottom left corner as being the graphics origin with coordinates of 0,0. The Programmer's Reference Manual seems to prefer a system where the graphics origin is at top left, so the y axis is measured in negative units.

The final variable is *nicons%*, which stands for *number of icons*. For most windows we will want to set this number to zero, but where we do include icons in the initial window definition we must follow it with information about the icons – 32 bytes each.

| | |
|---|---|
| **0** | Ignore mouse clicks |
| **1** | Notify the program when the pointer is over this icon |
| **2** | Clicks auto-repeat and notify the program |
| **3** | Clicks are de-bounced and notify the program |
| **4** | Click selects, release notifies program or deselects if the mouse has moved away from the icon in the meantime |
| **5** | Click selects, double-click notifies program |
| **6** | As 3 but can drag |
| **7** | As 4 but can drag |
| **8** | As 5 but can drag |
| **9** | Select when mouse is over icon, notify if clicked |
| **10** | Click returns mouse button state*256<br>Drag returns mouse button state*16<br>Double-click returns mouse button state |
| **11-14** | Reserved |
| **15** | A writeable icon, click positions the caret. |

The concept of dragging is to have an object following the mouse pointer. The dotted rectangle that follows the pointer when you click Select in the title bar of the menu box is one type of drag box. We do not use any other type of drag box in the Accounts program.

*Table I: The button types*

The first 16 bytes of a window's parameter block set out the coordinates of the initial VWA. Although you may subsequently stretch or shrink the window size, the first time it is opened it will appear on the screen in the size you have specified here.

The next eight bytes inform the Wimp Manager which part of the TWA is initially visible. Usually we want to have the top left part visible, so *block%!16* is set to zero and *block%!20* is set to the maximum y measurement – *twaty%*. Of course if you want the bottom right you should set *block%!16* to *twatx%* and *block%!20* to zero.

All windows currently on screen are represented by a list, and their position in this controls which ones obscure others. When you set up the window you can decide where in the list you want it to go. The value is held in *block%!24* and if this is –1 the new window is put in front of all others on the screen. If you want it to appear behind – underneath – another window *block!24* should contain the handle of the one that is to be on top.

The colours of the icon bar are controlled by *block%?32* and *block%?33* – foreground and background colours respectively. The scroll bars' fore and background colours are contained in *block%?36* and *block%?37*.

## Writing windows

Some windows are writeable – you can type information from the keyboard on to them. By setting *block%?38* to a colour's value the Wimp Manager will alter the window's borders accordingly when Select is clicked in the window. Acorn must have some feature up its sleeve which has not yet been implemented. For this reason *block%?39* must always be zero.

The next 16 bytes tell the Wimp Manager how big the total work area is – measured in the normal graphics coordinates. Due to the fact that we assume the graphics origin is always at bottom left, the first eight bytes are set to zero. The second eight contain the coordinates for the top right corner.

The title bar is, in fact, an icon – one that contains text which is centred horizontally, has a border and a filled background. If you try out those four things with the utility procedure PROCiconflag you will find that the resulting code is &2D. This should be stored in *block%!56*

The next four bytes are for the work area button type with exactly the same layout as the normal icon flags, except that nothing is set apart from the button type. You can calculate this by running the utility procedure PROCiconflags and answering *No* or zero to every question except that of button type.

A button, by the way, is an icon on the screen that you should click before the program proceeds further. If you type something into the notepad on DeskTop and then click Exit, a message appears telling you that there is unsaved data in the notepad and do you want to continue, Yes or No. The boxes containing the Yes and No are buttons and the program stops until you click one of them. The adjacent table shows the button types.

## Utility procedures

As long as you are only going to use the system area sprites – ones loaded with the command *SLOAD – *block%!64* should be set to zero. More future developments are catered for in *block%!68* so it should also be zero. The next 12 bytes are set aside for the title, which is made up of 11 characters plus Return.

The Wimp Manager call in line 590 gives you the handle of the window that has just been created. This is the value returned by the function and used by the program to keep track of which window does what. If you define a window where

Turn to Page 44 ▶

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MU3

◀ From Page 42

the VWA is larger than the TWA you will get the error message *Bad work area extent*.

The final part of this month's article consists of three utility procedures. The first decodes an icon flag:

```
5700 DEFPROCdecodeicon(q%):RESTORE5770:PRINT"
This icon:-"
5710 FORi%=0TO10:READa$:IF(q%AND(1<<i%))=(1<<
i%)PRINTTAB(5)a$
5720 NEXT
5730 FORi%=12TO16STEP4:READa$:j%=q%AND(&F<<i%
):PRINTTAB(5)a$" ";j%>>>i%:NEXT
5740 FORi%=21TO22:READa$:IF(q%AND(1<<i%))=(1<
<i%)PRINTTAB(5)a$
5750 NEXT
5760 FORi%=24TO28STEP4:READa$:j%=q%AND(&F<<i%
):PRINTTAB(5)a$" ";j%>>>i%:NEXT:ENDPROC
5770 DATAcontains text,is a sprite,has a bord
er,has text centred horizontally
5780 DATAhas text centred vertically,has fill
ed background,text is anti-aliased
5790 DATAneeds program's help for re-drawing,
data is indirected,has right-justified text
5800 DATAmulti-select with <Adjust>,button ty
pe,ESG number,icon has been selected
5810 DATAicon is disabled,foreground colour,b
ackground colour,font number
```

Once it is entered into the micro simply type:

```
PROCdecodeicon(x%)
```

where *x%* is a number you want to analyse and the procedure will tell you what the flag means for an icon.

The next two utilities create and decode the window flag. The utilities ignore bits 16,17 and 18 because these are set and unset by the Wimp Manager, not by your program.

```
 5900 DEFPROCwindowflag:RESTORE5740:q%=0
 5910 FORi%=0TO9:READa$:PRINT'a$"? Y/N";:g%=G
ET:IFg%=89q%+=1<<i%
 5920 PRINT~q%:NEXT
 5930 PRINTq%,~q%:ENDPROC
 5940 DATAA title bar,Is it moveable,Vertical
 scroll bar,Horizontal scroll bar,Redrawn ent
irely by Wimp,Is it a pane,Allowed outside ma
in area,No 'quit' boxes,Scroll-request (auto-
repeat),Scroll request (debounced),Window is
open
 6000 DEFPROCdecodewindow(q%):RESTORE5930:PRI
NT"This window:"
 6010 FORi%=0TO9:READa$:IF(q%AND(1<<i%))=(1<<
i%)PRINTa$
 6020 NEXT:ENDPROC
 6030 DATAhas a title bar,is moveable,has a v
ertical scroll bar,a horizontal scroll bar,ca
n be redrawn entirely by Wimp,is a pane
 6040 DATAis allowed outside main area,has no
 'quit' boxes,returns scroll-request (auto-re
peat),returns scroll request (debounced)
```

● *So now you can create windows – but they still won't appear on the screen. For that we need a bit more programming which we'll look at next month.*

## The bottom line...

**This series on Wimps began in the January 1989 issue of *The Micro User*.**

**Part one covered creating menus and the second article considered how to determine what selections have been made.**

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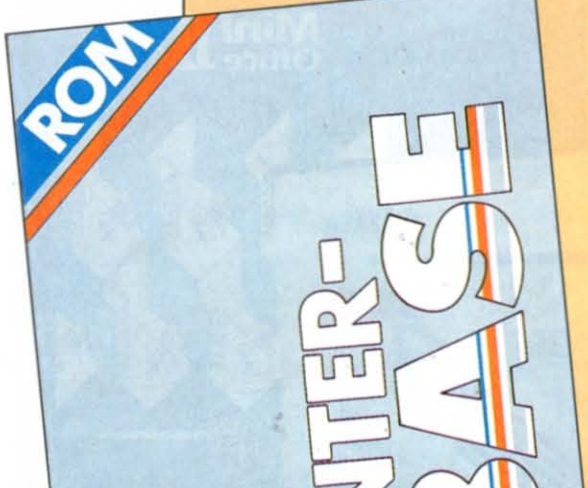

# Straight data

## Inter-Base comes of age and John Allen celebrates

*Product: Inter-Base*
*Price: £69*
*Supplier: Computer Concepts Ltd., Gaddesden Place, Hemel Hempstead, Herts HP2 6EX.*
*Tel: 0442 63933*

**THE Inter series database for the BBC Micro is at last properly available. It crept out in the middle of 1987 but was never properly launched, persistent bugs and an impossibly difficult manual conspiring to keep it to the dedicated few. Now Computer Concepts has judged that it is really ready for release, with new coding and a much larger – and easier to understand manual.**

Inter-Base is the final part of the company's Rom-Link products adding a database to the word processor Inter-Word, spreadsheet Inter-Sheet, graphics Inter-Chart and the related spelling checker Spell-Master. Being part of the series, it can exchange data with the other packages via special commands – but more of that later.

First off, what's in the box? Inter-Base is a rom with 64k of code which, like Inter-Word, is fitted on to a small circuit board with some clever electronics to make the BBC Micro think it's only the standard 16k, while all 64k of code is still available.

The whole thing is a bit taller than a 16k rom but fits most rom boards on the BBC B and some cartridges for the Master. Also in the box is a function keystrip, an examples disc and the new manual.

Databases can be difficult things to understand, and Inter-Base is no exception. Broadly speaking a database is a program which maintains a file of information, where each connected group of items of data – say someone's name, address and telephone number – is called a record and each individual item – the name for example – is a field within that record.

So a number of related fields form a record and the collection of records is a database – usually in the order that they were entered. Generally we want to examine them in a specific order – alphabetically for example – so index files are created and used to display the records in the desired order. As well as maintaining the file, a database system generally needs to have some way of extracting the information it contains and Inter-Base will do all of these things.

It is probably best at this stage to compare Inter-Base to Viewstore, the equivalent database for Acornsoft's View family. Viewstore is a 16k rom which in outline does much the same sort of

### MAIL-MERGING WITH INTER-WORD

The manual does not show what seems to me to be the simplest way to link Inter-Base with Inter-Word, which is by using the former's commands embedded into the word processor document, obviating writing an actual program:

- Enter the Inter-Base card index and open the database with the appropriate index if you need one.
- Enter Inter-Word and load the document.
- At the first character position of the document use f1 to embed the colon command:

```
:READ REC f()
```

This reads the first record from the database file into the array *f*. This array is already declared by the card index for the purpose so it exists and the types match.

- Every time the Inter-Word document needs data from Inter-Base embed an EXPORT command at that point. For example if a name required in the document is in field 3 of the database you should embed:

```
:EXPORT f(3);
```

The semicolon stops a carriage return being sent, rather like in Basic's PRINT.

- In the final character position of the document embed:

```
:SKIP
```

which moves the database on to the next record.

- Set Inter-Word to print however many copies you require and print them.
- Go back to Inter-Base and close the database.

things. Information is extracted from the database by a number of disc-based utilities – they produce reports, for example, or can provide a file of information for mail merging in View.

While Inter-Base is capable of a similar range of actions it also has its own built-in programming language so its actions are easy to customise. Better still, the language contains virtually the whole of BBC Basic so it is only necessary to learn the extra database handling commands to be able to use it. The programming language makes Inter-Base potentially much more powerful.

When you enter Inter-Base the first thing you see is the card index program. This allows you to create a database, view it, add and delete records and a few other things like create indexes and print reports. In short this program does most of the things that you're likely to want to do with most databases. It also has an option which selects the programming menu which has an editor and other useful facilities to help in writing programs.

However there are some negative points, for instance it can only show one record at a time – Viewstore has a spreadsheet display as an alternative. Also the Inter-Base label printer, supplied on disc, is quite different. In one way it is better, having a screen designer to give more flexibility with the layout of the fields on the label. Against that there are serious shortcomings. It only prints on to stationery with one column of labels, and it only uses data from the first nine fields of a database – the instructions say ten, but as it only allows entry of single digits, and zero has no effect, the tenth field is inaccessible.

On the positive side, Inter-Base deals more sensibly with altered records. If new data is added in Viewstore and it makes the record larger than the space allocated to it in the file, you have to delete the record and create a new one at the end of the file. Inter-Base does all that automatically – there's no need to type it again.

It also allows any number of indexes for a file provided there is space in the directory. All Inter-Base indexes can be updated automatically to include new records as they are entered, and they can be conditional, so that only some records are included. I have found this extremely useful. For instance, say you keep membership records for a club which has an annual subscription, Inter-Base allows you to maintain 12 separate indexes for the subscriptions due each month. In Viewstore the conditional selection has to be done each time the data is required using the Select utility and a temporary index created from it.

Also included on the disc are utilities which will import existing databases from other systems. A test run on a ViewStore file of around 100 records, each with 10 fields, worked but was a little slow.

## The language

In order to use Inter-Base effectively you really do need to come to terms with the programming language – some of the commands are needed to transfer data to other Inter products and using the language does allow that little bit of customisation.

Forgetting its database functions for a moment, the Inter-Base language is really very similar to Basic. It runs – according to benchmark

Turn to Page 48 ▶

### The Data Protection Act

**Computerised databases containing personal information are covered by the Data Protection Act – this could include ones on a BBC Micro. If you keep such a database you'll need to register it with the Data Protection Registrar unless it satisfies at least one of the exemptions.**

**The most likely exemptions that will apply to users of BBC Micros are:**

- **Records kept for purely domestic or recreational purposes**
- **Membership records of unincorporated clubs – provided that none of the members has an objection.**
- **Data used purely for calculating wages, pensions or accounts.**

**If you are going to be setting up a database and are not certain whether it will be exempt it is advisable to take advice from the Data Protection Registrar. His address is:**

**Springfield House,**
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**Wilmslow,**
**Cheshire.**
**SK9 5AX**
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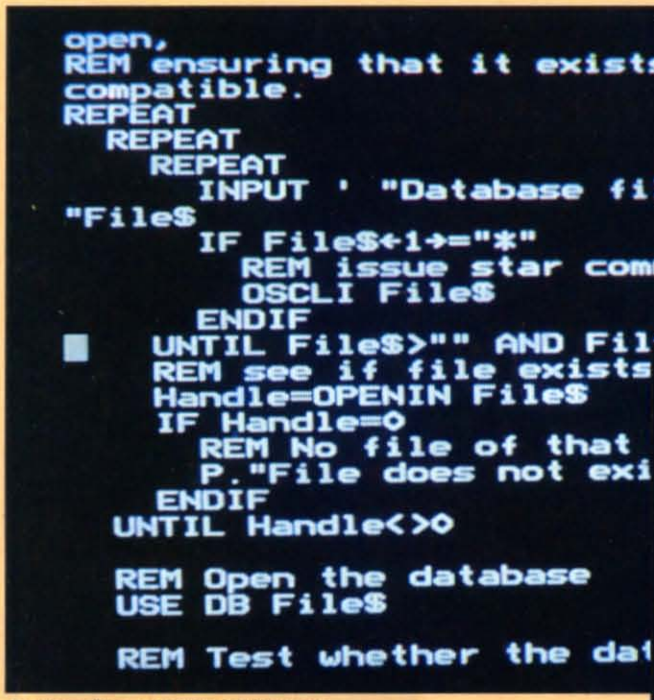
**(0625) 535777**

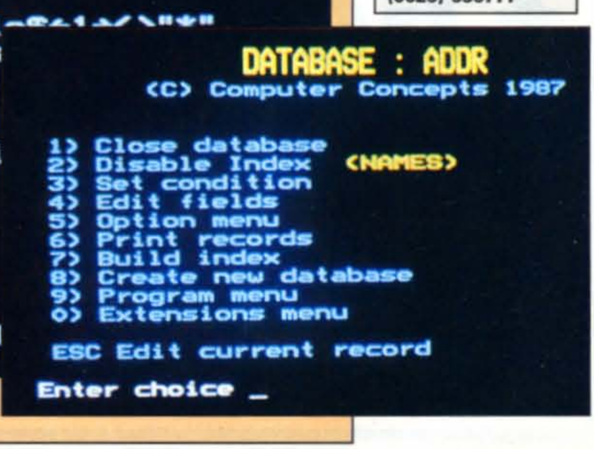


```
open,
REM ensuring that it exists and is
compatible.
REPEAT
  REPEAT
    REPEAT
      INPUT ' "Database filename
"File$
      IF File$←1→="*"
        REM issue star command
        OSCLI File$
      ENDIF
█   UNTIL File$>"" AND Fil
    REM see if file exists
    Handle=OPENIN File$
    IF Handle=0
      REM No file of that
      P."File does not exi
    ENDIF
  UNTIL Handle<>0

  REM Open the database
  USE DB File$

  REM Test whether the dat
```

*The Inter-Base programming language . . .*



```
                    DATABASE : ADDR
            <C> Computer Concepts 1987

  1> Close database
  2> Disable Index   <NAMES>
  3> Set condition
  4> Edit fields
  5> Option menu
  6> Print records
  7> Build index
  8> Create new database
  9> Program menu
  0> Extensions menu

  ESC Edit current record

Enter choice _
```

*. . . and main menu*

◀ From Page 47

tests – about 10 per cent slower, even so it has advantages over the normal Basic on the BBC Micro:

- Programs have no line numbers and are created through the Inter-Base program editor.
- There are control structures similar to Archimedes Basic, like WHILE ... ENDWHILE loops, and CASE ... ENDCASE to allow several alternative actions.
- Arrays can have irregular dimensions, and different elements can be of different types, allowing strings to be mixed with integers, reals and dates in the same array and only the elements that are going to be used have to be defined.

The card index program and the program menu are written in the language, so there is already a mechanism to run programs from rom. Additionally Inter-Base contains a formatter to write programs into sideways ram, so it's possible to gain up to 16k of extra space for storing variables in main memory, which can be very useful.

## Using Rom-Link

The whole idea of the Inter series is that it can interact in memory and allow data to be readily transferred. The usual way for other packages to extract data from Inter-Base is for the calling package to run an Inter-Base program which contains the command EXPORT to send the data.

The examples disc contains a sample program to extract data for mail merging from Inter-Word. This seems to be unnecessarily complicated, since it can easily be done by embedding single commands in the Inter-Word document and having the relevant database open in the Inter-Base card index program. Used like this, mail merging is a doddle – far easier than with View and Viewstore – and as the data is on disc the number of letters that can be sent is not limited by memory. However the fact that there are two methods demonstrates the tremendous versatility of the system.

## Conclusions

If you want a database with a fixed range of things neatly worked out for you, I wouldn't recommend this one – others are simpler. But if you are prepared to do the odd bit of programming yourself and want almost limitless flexibility you should seriously consider Inter-Base.

If you already use any of Computer Concept's Rom-Link products Inter-Base has obvious advantages with very good integration between them. The new manual is a lot better but you still need to sit down and experiment for quite a while before you get the hang of writing programs of any complexity.

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**Your technical questions answered by MIKE COOK**

# PROBLEM SOLVED

## Random errors

HALF an hour after I switch on my old BBC B issue 3 – Basic I, Watford rom/ram board and two solderless ram boards – it fails to run most programs, but View will still work. When I check the micro with the Watford diagnostic disc I find that there is an error in the ram part – not always the same address but more or less random like &5FF3, &6400 or &7512.

The micro has run quite well for five years now and is not overheating. Have you any idea what the problem is and how I can solve it? – **D. Roovers, Almere, Holland.**

● *On the face of it your micro appears to have a simple memory fault but the cause could be one of many things. The simplest explanation is that the ram chips themselves are at fault. However, if they are I would expect that you might also have random errors when using graphics in Modes 0, 1 and 2.*

*One way to test if it is the chips is to swap the first and second 16k memory blocks over. This can be done by swapping IC65 with 57, 61 with 53, 66 with 58, 62 with 54, 63 with 55, 67 with 59, 64 with 56 and 68 with 60. If the diagnostic reveals that the faulty memories are now below &400 the original high number in each part would be replaced.*

*However these apparent memory errors could be due to loading or timing problems. To see if this is the case remove all the extra boards from your micro and run the diagnostic program again. If the errors have disappeared a timing or loading problem would be confirmed. One way of curing this is to replace IC14 – a 74LS245 – with a 74ALS245. This will give the extra speed and drive needed by your system.*

## Bugged by buggies

I AM part way through making a computerised buggy for my Craft/Design/Technolgy GCSE. I need my BBC Micro to sense both the front and back bumpers plus hopefully about eight further switches using the last analogue input.

To do this, I was wondering if it is possible to make the switches using something similar to the conducting foam concept keyboard idea detailed in the November 1986 issue of *The Micro User* via two lower value resistors connected to the analogue port.

Do you think that this would work and if so where can I acquire the foam and copper strip? – **David Nevard, Exeter.**

● *Yes, it should be possible to sense different voltages through the analogue input port. Remember, however, you will be restricted to sensing the lowest switch in the chain. Copper strip and foam can be obtained from Musbury Consultants as Body Build Pack no 36 (£7.50). This went with the Body Build Article in November 1986.*

## Mousing about

I USE a BBC Micro a lot for my school work. I enjoy using CAD packages, and have the Nidd Valley Illustrator and AMX mouse. I want to use the mouse in my own programs, but don't have an AMX rom fitted and was wondering if there was a way to detect the mouse without it. – **Mark Gregory, Rugby, Warwickshire.**

● *You can easily use a mouse by writing a background task in machine code. This was covered in the February 1985 Body Building article. Although this concerned itself with a track ball, the signals are the same from a mouse. However the AMX mouse uses a slightly different pin-out, which was given in the July 1986 issue. The change can easily be accommodated by slight alterations in the software patch.*

## Drive difficulties

I HAVE recently fitted a switchable double disc drive to my BBC Micro but I do not seem to be able to read or write to it. This means that my old discs will not operate at all and I receive an error message such as *Disc fault*.

Instructions describing the drives and setting up suggest soldering an 8-way Dip switch to the bottom right of the keyboard to allow me to select the operating speed of the DFS to match the drives. My last drive didn't need this. Could this be my problem, and if so do I need to fit this Dip switch? – **A. Leong, Eccles, Manchester.**

● *The DIP switches on the corner of the keyboard are used to speed up disc access, and as drives*

**Turn to Page 50 ▶**

### On the agenda...

- **Making contact with a Compact**
- **Making boxes for holding discs**
- **Handling ram corruption and overloading**
- **Making a drive read a disc**
- **Devising detection switches for buggies**
- **Getting control of your mouse**
- **Spending too much time on the analogue port**
- **Waking up a sluggish micro**
- **Quieting a noisy disc drive**

◀ From Page 49

*will always work with the slower speed there is no need to tamper with that. Full details of these switches can be found in the Advanced User Guide.*

*You say that your old discs will not work with your new drive, but what about new discs? If you can format and use them but not your old ones, it is likely that the fault is head alignment either in your old drive or the new one. If the fault was in your old drive you could deliberately misalign your new drive to work with your old discs but this is a little dangerous as you run the risk of not being able to use other people's discs.*

*If, however, the drive will not work with new discs either, the fault is in your new drive or the cable. As it is a twin unit, make sure that the terminating resistor pack is only fitted to one drive.*

> *“I never recommend using the BBC Micro's own power supply for running disc drives simply because it can lead to problems”*

## Compact compatibility

IN your March 1988 issue I saw an article about building an Etch-a-sketch interface. Is it possible to link this hardware to my Master Compact? – **Elliot West, Loughton, Essex.**

● *Unfortunately this is not possible – this interface relies on the analogue to digital converter available in other Acorn machines, but the Compact does not have one. The joystick port uses switched digital input.*

## Analogue errors

I ACCIDENTALLY broke the analogue port when I plugged a joystick into my micro. I carefully removed it but left in the ADC chip in IC73. Recently, however, for some reason this chip has caused a lot of games like Barbarian, Pipeline and Omega Orb to crash as they load, and other games like Spellbinder become impossible to complete. After removing the chip, all the games work, and I have finally completed Spellbinder. Have you any idea why this happened? – **J. Byrant, Dronfield Woodhouse, Sheffield.**

● *You might have shorted some lines on the fire buttons, but as this does not go though the A/D chip it seems unlikely. What is more probable is that the A/D converter developed a fault quite independently of the physical damage to the socket. It sounds as though increased interrupts are being generated, causing the micro to slow down at crucial points. This could affect some protection routines and produce other random effects within games programs.*

*Removing the port simply because of a mechanical fault was a little extreme – replacing it would probably have been better.*

## A time to fail

I HAVE a BBC B with ATPL rom board and an Acorn 0.9 DFS with a Toshiba 40/80 disc drive which uses the micro's power supply. My problem is that when I first turn on the system, put in a disc and try to catalogue it to run a game or do anything else, I am notified that there is a disc fault and the drive switches off.

This has been going on for a couple of years now. I can usually make the drive work properly by unplugging the connector which goes to the micro's power supply and putting it back on again in quick succession. Recently even this has failed to work and I have to leave the micro alone and wait for it to work naturally – it takes twice as long for 40 track mode. But sometimes it works as soon as I turn it on.

I have replaced the lead which supplies the power to the drive but this has had no effect. The problem also occurred on another 80 track drive. Please could you find the solution? – **S.R. Mansfield, Margate, Kent.**

● *The solution is quite simple – I never recommend using the BBC Micro's own power supply for running disc drives simply because it can lead to problems like yours. The internal supply can't supply the switch on surges, so your solution is to get an external power supply. There is also a faint possibility that your problem could be a faulty auxiliary power socket.*

## Annoying noise

I HAVE a Master with a very noisy Watford twin 40/80 disc drive. My previous drive, also a Watford one, had an acceptable noise level. I have taken it back once and Watford assures me that it is quite all right. I admit that it appears to work, but I find the klonking and thumping very distracting. Is it a case of you get what you pay for? Can you advise on an alternative quiet disc drive or perhaps something can be done with this one? – **Majorie Costa, Ware, Herts.**

● *What noise annoys an oyster? A noisy disc drive perhaps. I don't like my disc drive to be silent, preferring to know that it's working. Having said that, some drives are noisier than others but it is something that is never mentioned in the specifications.*

*Also a lot depends on the ambient noise level where you have your micro and the way your equipment is arranged. Is the drive sitting on something that could be acting as a sounding box and making matters worse? If that is the case a little re-arrangement might work wonders. If not make sure you hear the replacement before you part with more cash.*

## Boxing clever

I AM working on a GCSE tehnology project and am considering making a disc organiser to facilitate finding of discs. I would like to know what limits it has to conform to, especially in respect of temperatures, materials regarding magnetism and so on. – **Lee Clarke, Wimborne, Dorset.**

● *There are no recognised standards for boxes or disc wallets and there is little you can do in a box economically to protect discs from temperature and magnetic fields. A box made of mu-metal would protect the contents from stray magnetic fields, but it would be quite expensive, heavy and fragile.*

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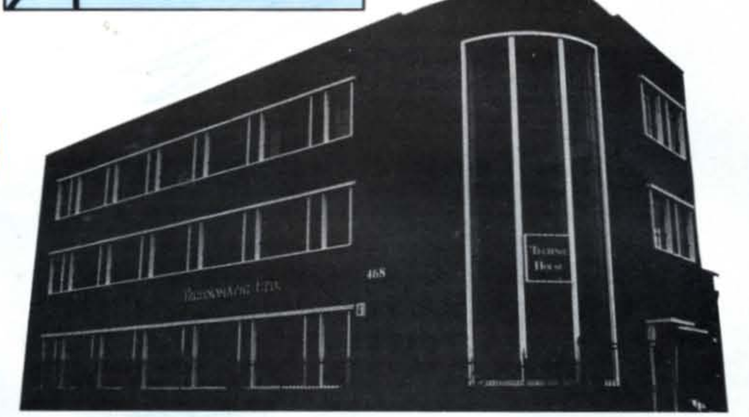

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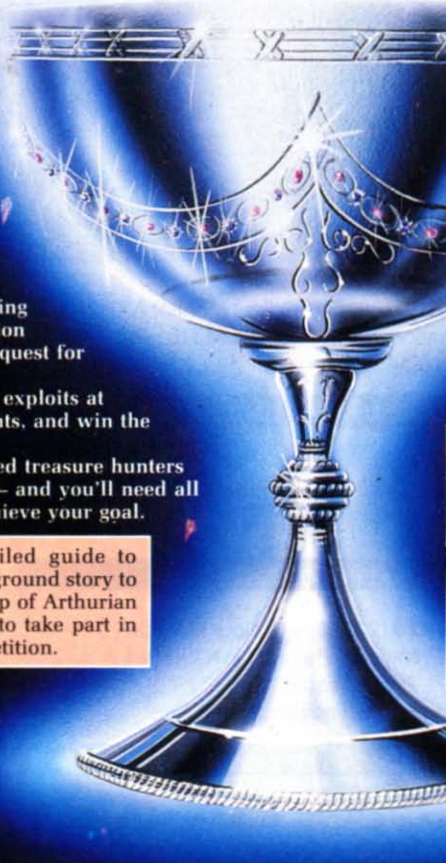

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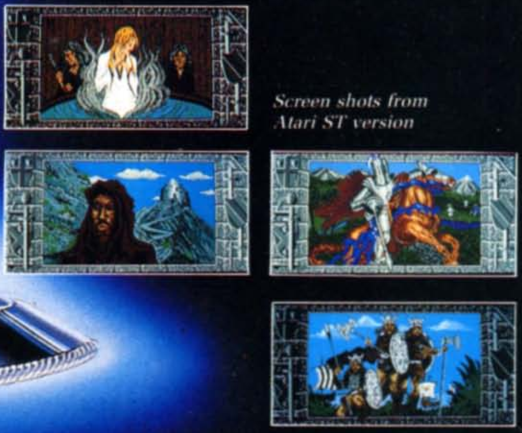

*Screen shots from Atari ST version*

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# Orthogonal Patience

*Gyles Harvey takes a right-angled view of the popular card game*

**THERE are many different versions of that old card game Patience, most representing the seven column sort. However here's a completely different one to allow you to while away a lazy hour. The cards are dealt on to screen in four rows of 13 and the idea is to sort them into numerical and suit order with the twos on the left and kings on the right**

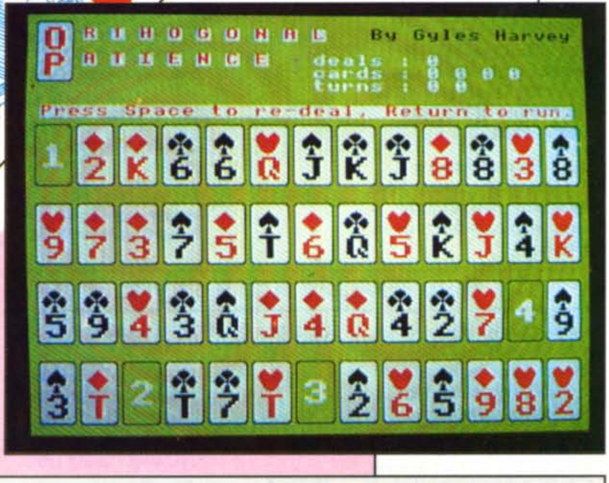
You do this by removing the aces and moving cards into the spaces left behind. But the only card that can be put into a space is one next in sequence and in the same suit as the one to the left of the gap. So you can't move a card on to the second of two consecutive gaps, or next to a king. And there lies the challenge!

Eventually you may reach a position where you can't move into any of the four gaps. Then you collect all the cards that don't follow correctly from a two in the leftmost position, shuffle and deal them. The measure of how well you solve the problem is how few – or many – times you need to do this.

The program is in three sections to allow it to be used on any BBC Micro or the Z88. On either machine, type in the base section – Listing I – followed by the appropriate section for your micro. Use Listing II for a Z88 and Listing III for the BBC Micro. Make sure you don't add any extra spaces for this one as memory is a bit tight.

The BBC Micro-specific part of the listing is much longer than the Z88 section as it contains code for expanding characters on to a two by two grid for the numbers and also large character definitions for the suits.

You press keys one to four to specify which space you want to fill and illegal moves are trapped. When a space is at the leftmost position you are asked the suit of which two you want there. When you get stuck pressing the spacebar will re-deal the cards that are not in position. Should you get really stumped Return is available as a last resort to re-start the game.



By Gyles Harvey

deals : 0
cards : 0 0 0 0
turns : 0 0

Press Space to re-deal, Return to run.

Move the two of diamonds to position one

*Listing I: The core program*

```
 10 REM Orthogonal Patience
 20 REM By Gyles Harvey
 30 REM (c) The Micro User
 50 PROCcomputer
 60 PROCinit
 70 PROCscreen
 80 PROCshuffle
 90 PROCdeal
100 PROCkeys
110 IF K%=6:RUN
120 PROCmess(16,16,"YOU WIN")
130 K%=GET:RUN
140 DEFPROCinit
150 DIMl(4,1)
160 DIMM%10,p 52,O%52,s 52,B%4
170 FORA%=0TO4:B%?A%=0:NEXT
180 FORA%=0TO52:p?A%=0:NEXT
190 s$="CDHS"
200 n$="A23456789TJQK"
210 d=-1:U%=0:V%=0
220 ENDPROC
230 DEFPROCshuffle:LOCALT%
240 FORC%=0TO51:IFp?C%<>255p?C%=0:s?T%
=C%:T%=T%+1
250 NEXT
260 FORR%=0TO3:FORD%=B%?R%TO12
270 REPEATE%=RND(T%)-1:UNTILs?E%<>255
280 O%?(R%*13+D%)=s?E%:s?E%=255
290 NEXT:NEXT:ENDPROC
300 DEFPROCdeal:LOCAL X%,Y%
310 d=d+1:PROCscore
320 FORY%=0TO3:FORX%=B%?Y%TO12
330 PROCdraw(X%,Y%+1):NEXT:NEXT
340 ENDPROC
```

Turn to Page 55 ▶

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## Fun Words (Early Reading) Age 4-6 yrs.

**FUN WORDS** consists of four programs, specially devised to build your child's sight vocabulary.

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4. Build a House

Each program is played on its own and the child does not need to master the words in the first program before tackling the next.

All objects illustrated are very familiar to children and frequently occur in other reading schemes

Cheshire Cat **FUN WORDS** includes:-

| | |
|---|---|
| Learn Word | – sight vocabulary. |
| Word Game | – an exciting test of the words presented so far. |
| Big/Little | – an extension of sight vocabulary. |
| Big/Little Game | – an easy review and test on the previous concept. |
| Lots of | – introducing plurals |

## Fun Sums (Maths Level 1) Age 4-6 yrs.

Sixteen flexible excercise programs of games for up to four children are contained on twin cassettes or disk programmed for the home computer.

Each child's name is entered at the start and a complete record of results kept. All games can be set at two ability levels with any number of games for each exercise.

Right answers to a problem brings a Cheshire Cat grinning from the screen, a correct tick and a happy tune. Wrong answer and the program gives the unsuccessful child extra help.

Includes:-

| | |
|---|---|
| Counting: | Keep count of Kicker Kangaroo's goal scoring |
| Number Recognition: | Sail the required number of boats into harbour. |
| Sorting: | Put the right coloured shapes into sets. |
| Addition: | An easy introduction to sums and to those + and = symbols-coloured beads give a visual aid. |
| Patterns: | A fun hello to the important concept of sequences. |
| Tallest: | Spot the highest flower an exercise in visual perception. |

**and much, much more...**

## Adder Sums Age 7-8 yrs.

A sixteen flexible exercise program of games for up to four children are contained on twin cassette or disk programmed for your home computer.

Each child's name is entered at the start and a complete record of results kept. All **ADDER SUMS** games can be set at one of two ability levels with up to any number of tries per child in each.

Right answers bring a Cheshire Cat grinning from the screen, who quickly steps in to help the child in difficulty.

Cheshire Cat **ADDER SUMS** includes:-

| | |
|---|---|
| Multiplication: | Calculate the cost of items shown in the grocer's shop window. |
| Addition: | Correctly total the shopping bill from the grocers |
| Division: | Share out the biscuits using the simple technique provided. |
| Time: | Learn to tell the time of day, days of the week and the months of the year. |
| Tables: | Make a start or improve on those important times tables. |

## Sum Takeaway (Maths Level 2) Age 6-7 yrs.

Nineteen flexible excercise programs of games for up to four children are contained on twin cassettes or disk programmed for your home computer.

Each child's name is entered at the start and a complete record of results kept. All games can be set at two ability levels with with up to 100 games for each exercise.

Right answers bring a Cheshire Cat grinning from the screen, a correct tick and a happy tune. Wrong answer and the program gives the unsuccessful child extra help.

Cheshire Cat Sum-Takeaway includes:

| | |
|---|---|
| Addition: | Full hello to sums. |
| Subtraction: | Starts with differences and introduces Take Away. |
| Charts: | Ways of recording information. A vital concept in the child's future. |
| Tens & Units: | Delightful visual hello to numbers over nine. |
| Multiply: | First step in those times tables and the 'X' sign. |

## Sum Measure Age 9-13 yrs.

Six programs with a choice of 6, 10 or 20 questions are contained on twin cassette or disk programmed for your home computer.

Two chances are given to achieve the correct answer, but don't worry extra help is provided for a child in difficulty.

At the end of each run the results are displayed thereby facilitating the monitoring of the child's progress

Cheshire Cat **SUM MEASURE** includes:-

| | |
|---|---|
| Length: | Work out the length of a line in centimetres or millimetres. |
| Area: | Find the area of a rectangle using $cm^2$. |
| Volume: | Give the volume of a cuboid in $cm^2$. |
| Temperature: | Work out the temperature shown on the thermometer. |
| Mass: | Read the correct balance scale |
| Capacity: | Measure the amount of liquid in the cylinder. |

## Sum Times (Maths Level 4) Age 8-9 yrs.

Nineteen flexible exercise programs of games for up to four children are contained on twin cassettes or disk programmed for your home computer. Each child's name is entered at the start and a complete record of results kept. All games can be set at two ability levels with with up to 100 games for each exercise. Right answers bring a Cheshire Cat grinning from the screen, a correct tick and a happy tune. Wrong answer and the program gives the unsuccessful child extra help.

Cheshire Cat Sum Times includes:

| | |
|---|---|
| Tally & Bar Charts: | An easy introduction to graphs. |
| Time: | A moving clock for digital time. |
| Tens & Units: | Addition & Subtraction of numbers over nine. |
| Symmetry: | Lines of symmetry. |
| Co-ordinates: | Important for reading maps and graphs. |
| Square Units: | Invaluable for calculating areas etc. |

**and much, much more . . .**

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◀ From Page 53

```
 350 DEFPROCkeys
 360 REPEAT REPEAT
 370 K%=INSTR("1234 "+CHR$13,GET$)
 380 UNTILK%>0
 390 PROCmess(20,20,""):PROCscore
 400 IFK%<5:PROCswap(K%)
 410 IFK%=5:PROCredeal
 420 PROCscore
 430 UNTILK%>5
 440 ENDPROC
 450 DEFPROCredeal
 460 PROChowcomplete
 470 LOCAL F%,R%:F%=TRUE
 480 FORR%=0TO3:IFB%?R%<>12:F%=FALSE
 490 NEXT
 500 IFF%K%=7 ELSEPROCshuffle:PROCdeal
 510 ENDPROC
 520 DEFPROCswap(N%)
 530 G%=l(N%,0):H%=l(N%,1):V%=V%+1
 540 IFG%=0PROCwhichtwo:GOTO580
 550 F%=O%?(G%-1+13*H%)
 560 IFF%MOD13=12:PROCmess(3,3,"You can
not swap next to a King..."):ENDPROC
 570 IFF%MOD13=0:PROCmess(2,3,"You cann
ot swap next to a Space..."):ENDPROC
 580 LOCALX%,Y%:FORX%=0TO12:FORY%=0TO3
 590 IFO%?(X%+13*Y%)=F%+1:I%=X%:J%=Y%:X
%=13:Y%=4
 600 NEXT:NEXT:U%=U%+1
 610 C%=O%?(I%+13*J%):O%?(I%+13*J%)=O%?
(G%+13*H%):O%?(G%+13*H%)=C%
 620 PROCdraw(G%,H%+1):PROCdraw(I%,J%+1
)
 630 ENDPROC
 640 DEFPROCwhichtwo
 650 PROCmess(5,0,"Which 2 ...? (C/D/H/
S) ... ")
 660 REPEATN%=INSTR(s$,CHR$(GETAND&DF))
 670 UNTILN%>0:F%=(N%-1)*13:ENDPROC
 680 DEFPROChowcomplete
 690 FORR%=0TO3:B%?R%=0
 700 N%=O%?(13*R%)
 710 IFN%MOD13<>1THEN760
 720 B%?R%=1:p?N%=255
 730 FORD%=1TO11
 740 IFO%?(13*R%+D%)=N%+D%:p?(N%+D%)=25
5:B%?R%=D%+1ELSED%=13
 750 NEXT
 760 NEXT
 770 PROCscore
 780 ENDPROC
```

Get it right!

```
 10 =    0 0 | 150 = BBD4 3 | 280 = 83C6 C
 20 =    0 0 | 160 = 60D6 6 | 290 = BB05 F
 30 =    0 0 | 170 = 10DE D | 300 = 9F57 2
 50 = F21F F | 180 = 8322 F | 310 = 4A9E D
 60 = DEBB 7 | 190 = 4F42 D | 320 = 7123 2
 70 = 9538 5 | 200 = D44A 0 | 330 =  430 1
 80 = D787 4 | 210 = BA18 0 | 340 = ED0F 0
 90 =  D5C C | 220 = ED0F 0 | 350 = 5A41 7
100 = B0B6 6 | 230 = 60BA 8 | 360 = B1FE D
110 = AD84 8 | 240 = D1CC 1 | 370 = ECCD 4
120 = 8EAE 4 | 250 = 2C83 C | 380 = 1350 B
130 = 553A F | 260 = D916 E | 390 = 2851 5
140 = 344C 7 | 270 = EEDD D | 400 = 9833 5
```

```
410 = 5478 C | 540 = F03C A | 670 = C3A1 B
420 = CEC4 B | 550 = 4D85 B | 680 = 3F5A 2
430 = 43F5 E | 560 = A0A2 4 | 690 = DA54 4
440 = ED0F D | 570 = 6047 3 | 700 = 57FA D
450 = AD24 8 | 580 = 2023 A | 710 = 70FA 1
460 = 8D0A 4 | 590 = 9F18 D | 720 = 8F6A 2
470 = C206 E | 600 = 2B50 6 | 730 = E22E 7
480 = 7B0B C | 610 = 157B D | 740 = DE96 5
490 = 2C83 7 | 620 = 6E54 1 | 750 = 2C83 6
500 = 5A62 B | 630 = ED0F 8 | 760 = 2C83 5
510 = ED0F B | 640 = 3B84 2 | 770 = CEC4 1
520 = 4296 2 | 650 = 42E5 C | 780 = ED0F B
530 =  A1A 3 | 660 = 13C2 C |
```

### Listing II: Z88 Part

```
  40 CLS
1000 DEFPROCscreen
1010 REM Z88 CURSOR OFF ...?
1020 PRINTTAB(50,0)"O R T H O G O N A L
```

The truth about TELEX

How much does it cost to go on Telex?

You could go the conventional way and buy a dedicated Telex machine. The cheapest will cost you £1,604 (the Whisper), the dearest £2,892 (the Cheetah). You will also need a separate telephone line, costing £101 to install, plus £404 a year rental. That's a total outlay over the first year of a minimum of £2,109. (All prices include VAT.)

*Or you could do what more and more BBC Micro users are doing – use your BBC Micro to double as a Telex machine. And just use your ordinary telephone!*

How do I turn my BBC Micro into a Telex machine?

All you need is a modem and appropriate communications software (see the advertisements in this issue), a telephone, and a subscription to *MicroLink*.

Telex is just one of a growing number of services available to micro users on *MicroLink*. You can also read the news as it happens, go teleshopping, create your own closed user group, send telemessages and electronic mail right round the world, download free programs directly into your micro . . . and much more.

But why use Telex?

Because it's a standard means of instant communication between businesses. Today – there are 150,000 Telex machines in use in Britain – and more than 2 million worldwide. It's used to dramatically speed up business communications – it's just as quick as using the phone but far more efficient, because you have a hard copy of every "conversation" for your records.

But there's a big bonus you get when you use *MicroLink* for Telex that the conventional way doesn't offer.

With *MicroLink* you don't HAVE to be in your office to send or receive Telex messages. You can just as easily use your computer at home (or even a portable). So now you can check whether there are any Telex messages waiting for you – anywhere, anytime. How's that for your business efficiency?

**How to join:**
**Phone 0625 878888**

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```
 1030 PRINTTAB(52,1)"P A T I E N C E"
 1040 PRINTTAB(52,2)"By Gyles Harvey"
 1050 PRINTTAB(52,4)"Space  = re-deal"
 1060 PRINTTAB(52,5)"Return = re-run"
 1070 PRINTTAB(0,7)"deals :"TAB(20,7)"ca
rds :"TAB(40,7)"turns :";
 1080 ENDPROC
 1090 DEFPROCdraw(P%,R%)
 1100 E%=O%?(P%+13*(R%-1))
 1110 S%=E%DIV13+1
 1120 E%=E%MOD13+1
 1130 IFE%=1THEN1170
 1140 PRINTTAB(P%*3+5,R%-1)MID$(n$,E%,1)
;
 1150 PRINTMID$(s$,S%,1);
 1160 ENDPROC
 1170 PRINTTAB(P%*3+5,R%-1)"*";S%;
 1180 l(S%,0)=P%:l(S%,1)=R%-1
 1190 ENDPROC
 1200 DEFPROCscore
 1210 PRINTTAB(8,7);d;TAB(28,7);
 1220 FORL%=0TO3:PRINT;B%?L%SPC1;:NEXT
 1230 PRINTTAB(48,7);U%;" ";V%;
 1240 ENDPROC
 1250 DEFPROCmess(before,after,string$)
 1260 PRINTTAB(0,5)SPC(before)string$SPC
(after);
 1270 ENDPROC
 1280 DEFPROCcomputer
 1290 REM Z88 GENERATOR INITIALISE ...?
 1300 ENDPROC
```

*Listing III: BBC Micro part*

```
   40 MODE1
 1000 DEFPROCsuit(S%)
 1010 ONS%GOTO1020,1070,1120,1170
 1020 VDU23,128,0,1,7,15,15,55,123,125
 1030 VDU23,129,0,0,192,224,224,216,188,
124
 1040 VDU23,130,255,125,121,51,3,3,7,0
 1050 VDU23,131,254,124,60,152,128,128,1
92,0
 1060 ENDPROC
 1070 VDU23,128,0,1,3,7,15,31,63,127
 1080 VDU23,129,0,0,128,192,224,240,248,
252
 1090 VDU23,130,63,31,15,7,3,1,0,0
 1100 VDU23,131,248,240,224,192,128,0,0,
0
 1110 ENDPROC
 1120 VDU23,128,0,24,60,126,127,255,127,
127
 1130 VDU23,129,0,48,120,252,252,254,252
,252
 1140 VDU23,130,63,63,31,31,15,7,1,0
 1150 VDU23,131,248,248,240,240,224,192,
0,0
 1160 ENDPROC
 1170 VDU23,128,0,1,3,7,15,31,63,63
 1180 VDU23,129,0,0,128,192,224,240,248,
248
 1190 VDU23,130,63,61,25,3,3,3,7,0
 1200 VDU23,131,248,120,48,128,128,128,1
92,0
 1210 ENDPROC
 1220 DEFPROCchars
 1230 VDU23,136,0,0,0,0,0,3,6,4
 1240 VDU23,137,0,0,0,0,0,255,0,0
 1250 VDU23,138,0,0,0,0,0,192,96,32
 1260 VDU23,139,4,6,3,0,0,0,0,0
 1270 VDU23,140,0,0,255,0,0,0,0,0
 1280 VDU23,141,32,96,192,0,0,0,0,0
 1290 VDU23,142,4,4,4,4,4,4,4,4
 1300 VDU23,143,32,32,32,32,32,32,32,32
 1310 VDU23,144,0,0,0,0,0,0,1,3
 1320 VDU23,145,0,0,0,0,0,0,255,255
 1330 VDU23,146,0,0,0,0,0,0,128,192
 1340 VDU23,147,3,1,0,0,0,0,0,0
 1350 VDU23,148,255,255,0,0,0,0,0,0
 1360 VDU23,149,192,128,0,0,0,0,0,0
 1370 VDU23,150,3,3,3,3,3,3,3,3
 1380 VDU23,151,192,192,192,192,192,192,
192,192
 1390 VDU23,159,255,255,255,255,255,255,
255,255
 1400 ENDPROC
 1410 DEFPROCscreen
 1420 VDU23;8202;0;0;0;19,0,2;0;19,1,1;0
;19,2,0;0;19,3,7;0;
 1430 MOVE0,1024:PRINTb$:MOVE0,1024:GCOL
0,3:PRINTi$;CHR$4
 1440 VDU31,1,1:COLOUR131:COLOUR1:PROCex
pand(79)
 1450 VDU31,1,3:PROCexpand(80)
 1460 VDU31,4,1:PROCboxes("RTHOGONAL")
 1470 VDU31,4,3:PROCboxes("ATIENCE")
 1480 PRINTTAB(1,7)"Press Space to re-de
al, Return to run."
 1490 COLOUR128:COLOUR2:PRINTTAB(24,1)"B
y Gyles Harvey"
 1500 COLOUR3:PRINTTAB(20,3)"deals :"TAB
(20,4)"cards :"TAB(20,5)"turns :"
 1510 PROCgrid
 1520 ENDPROC
 1530 DEFPROCboxes(t$)
 1540 LOCALX%:FORX%=1TOLENt$
 1550 VDUASCMID$(t$,X%)9:NEXT:ENDPROC
 1560 DEFPROCcard(P%,R%,D%)
 1570 GCOL0,D%
 1580 VDU31,P%*3+1,R%*6+3
 1590 MOVEP%*96,(30-R%*6)*32
 1600 PRINTi$;CHR$4;
 1610 ENDPROC
 1620 DEFPROCgrid:LOCALX%,Y%
 1630 FORX%=0TO12:FORY%=1TO4
 1640 MOVEX%*96,(30-Y%*6)*32
 1650 PRINTb$CHR$4;:NEXT:NEXT:ENDPROC
 1660 DEFPROCdraw(P%,R%)
 1670 E%=O%?(P%+13*(R%-1))
 1680 S%=E%DIV13+1
 1690 E%=E%MOD13+1
 1700 IFE%=1THEN1770
 1710 PROCcard(P%,R%,3)
 1720 PROCsuit(S%)
 1730 COLOUR131:IFS%=1ORS%=4COLOUR2ELSEC
OLOUR1
 1740 VDU31,P%*3+1,R%*6+3,128,129,8,8,10
,130,131,8,8,10
 1750 PROCexpand(ASCMID$(n$,E%))
 1760 ENDPROC
 1770 PROCcard(P%,R%,0)
 1780 COLOUR128:COLOUR3
 1790 VDU31,P%*3+1,R%*6+4
 1800 PROCexpand(48+S%)
 1810 l(S%,0)=P%:l(S%,1)=R%-1
 1820 ENDPROC
 1830 DEFFNa(C%):LOCALT%
 1840 IFC%AND128T%=T%+192
 1850 IFC%AND64T%=T%+48
 1860 IFC%AND32T%=T%+12
 1870 IFC%AND16T%=T%+3
 1880 =T%
 1890 DEFFNb(C%):LOCALT%
 1900 IFC%AND8T%=T%+192
 1910 IFC%AND4T%=T%+48
 1920 IFC%AND2T%=T%+12
 1930 IFC%AND1T%=T%+3
 1940 =T%
 1950 DEFPROCexpand(!M%)
 1960 LOCALA%,L%,X%,Y%:A%=10
 1970 X%=M%:Y%=M%DIV256:CALL&FFF1
 1980 VDU23,132:FORL%=1TO4
 1990 A%=FNa(M%?L%):VDUA%A%:NEXT
 2000 VDU23,133:FORL%=1TO4
 2010 A%=FNb(M%?L%):VDUA%A%:NEXT
 2020 VDU23,134:FORL%=5TO8
 2030 A%=FNa(M%?L%):VDUA%A%:NEXT
 2040 VDU23,135:FORL%=5TO8
 2050 A%=FNb(M%?L%):VDUA%A%:NEXT
 2060 VDU132,133,8,8,10,134,135
 2070 ENDPROC
 2080 DEFPROCscore
 2090 COLOUR3:COLOUR128:PRINTTAB(28,3);d
;TAB(28,4);
 2100 FORL%=0TO3:PRINT;B%?L%SPC1;:NEXT
 2110 PRINTTAB(28,5);U%;" ";V%
 2120 ENDPROC
 2130 DEFPROCmess(before,after,string$)
 2140 COLOUR128:COLOUR3:PRINTTAB(0,6)SPC
(before)string$SPC(after);
 2150 ENDPROC
 2160 DEFPROCcomputer
 2170 PROCchars
 2180 S%=RND(-TIME)
 2190 b$=CHR$5+CHR$18+CHR$0+CHR$2+CHR$13
6+CHR$137+CHR$137+CHR$138+STRING$(4,STRI
NG$(4,CHR$8)+CHR$10+CHR$142+"  "+CHR$143
)+STRING$(4,CHR$8)+CHR$10+CHR$139+CHR$14
0+CHR$140+CHR$141
 2200 i$=CHR$5+CHR$144+CHR$145+CHR$145+C
HR$146+STRING$(4,STRING$(4,CHR$8)+CHR$10
+CHR$150+CHR$159+CHR$159+CHR$151)+STRING
$(4,CHR$8)+CHR$10+CHR$147+CHR$148+CHR$14
8+CHR$149
 2210 ENDPROC
```

**Get it right!**

```
  40 = EA3A A | 1400 = ED0F E | 1810 = 1840 F
1000 = A703 B | 1410 = F5B9 7 | 1820 = ED0F 9
1010 = 892D 6 | 1420 = 6869 3 | 1830 = F3DB 1
1020 = AC05 3 | 1430 = EC78 9 | 1840 = 1063 9
1030 = 71DC A | 1440 = 82E8 A | 1850 = F68A A
1040 = A99A 7 | 1450 = 3EF7 2 | 1860 = 30CD 5
1050 = 8B35 0 | 1460 = 665E 0 | 1870 = B0A5 F
1060 = ED0F E | 1470 = 8DEB C | 1880 = 3148 0
1070 = 52EB 2 | 1480 = 3F93 C | 1890 = DE9F A
1080 = E765 2 | 1490 = D17A 2 | 1900 = 3591 7
1090 = 63F5 6 | 1500 = 9925 9 | 1910 = D2F7 0
1100 = 9AF5 6 | 1510 = 58D2 0 | 1920 = D6C0 B
1110 = ED0F F | 1520 = ED0F F | 1930 = 16F9 0
1120 = F399 C | 1530 =  D68 B | 1940 = 3148 1
1130 = F63B 0 | 1540 = 303A 8 | 1950 = 899C A
1140 =  8C5 9 | 1550 = B10E 5 | 1960 = 26EB C
1150 = DD99 D | 1560 = 1F92 1 | 1970 = 6339 E
1160 = ED0F 4 | 1570 = 9C08 C | 1980 = CFE5 A
1170 = 3D45 C | 1580 = 18D8 6 | 1990 = 65A8 8
1180 = 751E 1 | 1590 = F7CB B | 2000 = 24C6 F
1190 =  ED8 4 | 1600 = C180 1 | 2010 = 8DE5 B
1200 = 6222 0 | 1610 = ED0F E | 2020 = 8821 C
1210 = ED0F 7 | 1620 = EC34 3 | 2030 = 65A8 F
1220 = 1613 6 | 1630 = 7D70 5 | 2040 = 6302 B
1230 = 58E4 9 | 1640 = D00B D | 2050 = 8DE5 B
1240 = 496E 2 | 1650 = AB5B 0 | 2060 = 9DE9 C
1250 = 72D8 6 | 1660 = E2FC F | 2070 = ED0F 2
1260 = DD8F 0 | 1670 = 3222 5 | 2080 = 65A0 E
1270 = C6FF 7 | 1680 = F7CE A | 2090 = 3B44 D
1280 = F39D 6 | 1690 = 5464 3 | 2100 = DD93 B
1290 = 707C E | 1700 = B7BC C | 2110 = ECC7 A
1300 = B665 B | 1710 = 84FD C | 2120 = ED0F B
1310 = 9250 9 | 1720 = 2D80 B | 2130 = CFA9 B
1320 = A881 2 | 1730 =  A40 2 | 2140 = D306 5
1330 = 9BD9 2 | 1740 = 102C C | 2150 = ED0F 8
1340 =  263 B | 1750 =  C4C 4 | 2160 = 789C A
1350 = 1478 E | 1760 = ED0F 1 | 2170 = BD77 B
1360 = 185F F | 1770 = D1AE 4 | 2180 = 5DE8 C
1370 =   E7 A | 1780 = 24B3 C | 2190 = D268 C
1380 = F782 6 | 1790 = 683F 4 | 2200 = F285 0
1390 =  79E 9 | 1800 = 5730 0 | 2210 = ED0F 9
```

# Let's get moving..

*Make your images come alive with this clever George Speller utility*

**THE BBC Micro is an excellent machine for producing cheerful and quick graphics with plenty of colour. However, while it's easy to draw instructive diagrams, producing animation of any kind is laborious and complicated. You often see simple animations for shop or museum displays which employ transparencies, masks, a rotating disc and a backlight to produce the illusion of movement in the picture – producing striking effects very simply**

Here is a program which can be used as an adjunct to any Mode 2 graphics package to allow a similar kind of animation that will indicate the flow of fluids or the propagation of radiation in eye-catching moving strips of colour. It uses a pre-drawn screen as a transparency, the masks are generated with the Flo program and the rotation is provided by sequencing the rarely used flashing colours – numbered 8 to 15. By using the VDU 19 command to alter the colour shown, the desired impression of movement can be produced.

The only complication is that the display must be handled by a short program or routine which keeps the colours rotating. It would be possible to write a background program to do this job by interrupts, but it is not necessary for most applications.

To use the system you must first create a Mode 2 picture which can be saved to disc as a block of memory from &3000 to &8000 – the normal procedure for saving graphics screens. When run, Flo loads it and you can place blocks and strips of colour on the picture, using size or angle and in a choice of two colours in solid stripes or dots. The animation can be tested at any time. Finally the enhanced picture is saved to disc for use with the Display program.

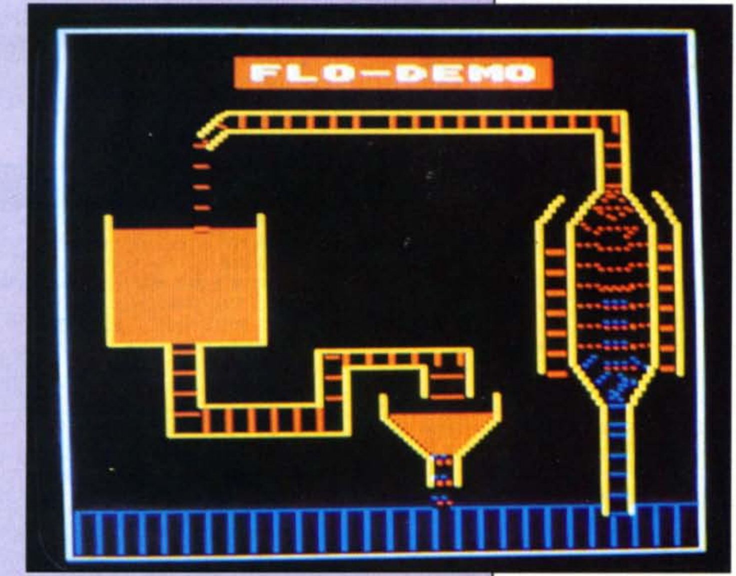
Type in the Flo listing and ensure it is correct by using Get it Right! When you run it you are first shown the keyboard controls, followed by a choice of message windows. You should choose one to conform with the type of graphics package initially used. For example if you use Nidd Valley's Grafik, select window number three.

The screen clears and you can now press L to load a prepared picture. You can place the cursor where you want the first block using the arrow keys and adjust its size with the game keys Z, X, * and ?. To rotate it use < and >. All functions may be speeded up by holding down Shift. The cursor will indicate size, colour and plot type at all times.

The colour may be selected using A or B. The solid or dotted plot is selected by C or D and pressing Tab irrevocably draws the block. Strange colour effects will appear momentarily, but they are soon sorted out by PROCcolsoff. Keep repeating the process until you are ready to test the animation by holding down M. Finally the screen may be saved by pressing S. Both filing functions are aborted if Return is pressed with no filename given.

It may be necessary to return to the original graphics package to tidy up the picture and you can keep swapping between applications as many times as required. Listing II is the simple Display which gives a numerical choice of colours for the final display and any two from one to seven may be selected to replace the red and blue in the design program.

Flo should provide more interest and clarity for your displays by adding a dynamic element to a static picture. It can simulate chemical plants, convection systems, biological circulations, radar, electrical circuits and can enhance practically anything you can draw.



## MAIN ROUTINES

| | |
|---|---|
| **keys** | Accepts keyboard control |
| **baseline** | Draws a cursor |
| **move** | Selects position of block to be drawn |
| **rotline** | Controls dimensions and angle of block |
| **Ins** | Draws the block |
| **animate** | Runs the animation |

```
10 REM FLO
20 REM by George Speller
30 REM (c) The Micro User
40 :
50 ON ERROR MODE 7:PROCerror:END
60 :
70 MODE 7:PROCinstr
80 MODE 2:VDU 23;11,0;0;0;0;
90 PROCsetup:PROCinit
```

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```
 100 REPEAT PROCkeys:PROCbaseline
 110 REPEAT UNTIL NOTINKEY-129
 120 PROCbaseline:UNTIL FALSE:END
 130 :
 140 DEFPROCinstr
 150 VDU 28,8,20,32,5
 160 PRINTTAB(7,0)"FLO"
 170 PRINT'"A/B....select colour"
 180 PRINT "C/D....continous or dots"
 190 PRINT "M......check motion"
 200 PRINT "L/S....load or save"
 210 PRINT "Tab....draw a block"
 220 PRINT'"Arrows.move"
 230 PRINT "Z/X....grow left/right"
 240 PRINT "*/?....grow up/down"
 250 PRINT "</>....rotate"
 260 PRINT "Shift..extra speed"
 270 PRINT'"Press space"
 280 REPEAT UNTIL GET=32:ENDPROC
 290 :
 300 DEFPROCinit:DIM b%256:*FX4,1
 310 addc%=0:start%=8:curcol%=1
 320 x1%=0:x2%=0:y1%=0:y2%=0
 330 X%=500:Y%=500:colA%=1:colB%=4
 340 side%=100:base%=40
 350 type%=5:F$="":GCOL3,1:ENDPROC
 360 :
 370 DEFPROCsetup:COLOUR 132
 380 FOR N%=1 TO 4:READ a%,b%,c%,d%
 390 VDU 28,a%,b%,c%,d%,12
 400 PRINTTAB(6)"Window ";N%;:NEXT
 410 DATA 0,30,0,1,0,0,19,0
 420 DATA 19,31,19,1,0,31,19,31
 430 VDU26:PRINTTAB(8,5)"FLO"
 440 PRINTTAB(3,7)"Please choose"TAB(3,
9)"display window"TAB(8,12)"1-4";
 450 REPEAT W%=GET-48:UNTIL W%>0ANDW%<5
 460 COLOUR 128:CLS:RESTORE
 470 FOR N%=1TOW%:READ a%,b%,c%,d%:NEXT
 480 VDU 28,a%,b%,c%,d%:ENDPROC
 490 :
 500 DEFPROClns(X%,Y%,W%,H%,A,T%,S%,A%)
 510 LOCALx%,y%,x1%,y1%:p=COSA:q=SINA
 520 FOR O%=0 TO 3:GCOL 0,S%+A%+O%
 530 FOR N%=O%*10 TO H% STEP 40
 540 x%=p*N%:y%=q*N%:x1%=q*W%:y1%=p*W%
 550 MOVEX%+x%,Y%-y%
 560 PLOTT%,X%+x1%+x%,Y%+y1%-y%
 570 NEXT:NEXT:PROCcolsoff:ENDPROC
 580 :
 590 DEFPROCcolsoff
 600 FORN%=8TO15:VDU19,N%;0;0;:NEXT
 610 VDU19,start%,colA%;0;
 620 VDU19,start%+4,colB%;0;
 630 ENDPROC
 640 :
 650 DEFPROCanimate:LOCAL L%,C%
 660 REPEAT L%=C%:C%=(C%+1)MOD4
 670 VDU19,start%+C%,colA%;0;0;
 680 VDU19,start%+L%;0;0;:*FX19
 690 VDU19,start%+C%+4,colB%;0;
 700 VDU19,start%+L%+4;0;0;:*FX19
 710 UNTIL NOTINKEY-102:*FX21
 720 PROCcolsoff:ENDPROC
 730 :
 740 DEFPROCmove
 750 IF INKEY-1 s%=5 ELSE s%=1
 760 X%=X%-4*s%*INKEY-122+4*s%*INKEY-26
 770 Y%=Y%-4*s%*INKEY-58+4*s%*INKEY-42
 780 ENDPROC
 790 :
 800 DEFPROCrotline
 810 IF INKEY-1 s%=20 ELSE s%=1
 820 ang=ang-INKEY-104*s%/60+INKEY-103*
s%/60
 830 side%=ABS(side%-INKEY-67*s%+INKEY-
98*s%)
 840 base%=ABS(base%-INKEY-73*s%+INKEY-
105*s%)
 850 p=COS(ang):q=SIN(ang)
 860 x1%=side%*p:y1%=side%*q
 870 x2%=base%*q:y2%=base%*p
 880 ENDPROC
 890 :
 900 DEFPROCbaseline:MOVEX%,Y%:*FX19
 910 GCOL3,7:PLOTtype%,X%+x1%,Y%-y1%
 920 MOVEX%,Y%:GCOL3,curcol%
 930 PLOT5,X%+x2%,Y%+y2%:GCOL3,7
 940 PLOT69,X%+x2%,Y%+y2%:ENDPROC
 950 :
 960 DEFPROCload
 970 REPEAT UNTIL INKEY-87=0:*FX15
 980 INPUT"Load filename",F$:CLS
 990 IF F$>"" PROCos("LOAD "+F$)
1000 PROCcolsoff:ENDPROC
1010 :
1020 DEFPROCsave
1030 REPEAT UNTIL INKEY-82=0:*FX15
1040 INPUT"Save filename",F$:CLS
1050 IF F$>"" PROCos("SAVE "+F$+" 3000
8000")
1060 ENDPROC
1070 :
1080 DEF PROCkeys
1090 PROCmove:PROCrotline:*FX21
1100 IF INKEY-97 PROClns(X%,Y%,base%,si
de%,ang,type%,start%,addc%)
1110 IF INKEY-87 PROCload
1120 IF INKEY-82 PROCsave
1130 IF INKEY-102 PROCanimate
1140 IF INKEY-66 addc%=0:curcol%=1
1150 IF INKEY-101 addc%=4:curcol%=4
1160 IF INKEY-51 type%=21
1170 IF INKEY-83 type%=5
1180 ENDPROC
1190 :
1200 DEFPROCos($b%):LOCALX%,Y%:X%=b%
1210 Y%=X%DIV256:CALL&FFF7:ENDPROC
1220 :
1230 DEF PROCerror:*FX4
1240 IF ERR=17 PRINT"Finished" ELSE REP
ORT:PRINT" at line ";ERL
1250 ENDPROC
```

**Get it right!**

```
  10 =    0 0 | 430 = E568 A |  850 = 8186 C
  20 =    0 0 | 440 = 5192 F |  860 = 7C3E 2
  30 =    0 0 | 450 = 9EBC 7 |  870 = BC8F 2
  40 = 9719 9 | 460 = 84D8 3 |  880 = ED0F 4
  50 = C629 E | 470 = 2888 6 |  890 = 9719 6
  60 = 9719 F | 480 = CD1B F |  900 = C1B9 1
  70 = 9398 5 | 490 = 9719 7 |  910 = 41AA F
  80 = 3E9A 5 | 500 = 689C 7 |  920 = 669D E
  90 = 5E26 B | 510 = 2CD4 1 |  930 = E39A 6
 100 = B31C 0 | 520 = 353A F |  940 = 9381 1
 110 = 1EDC D | 530 = 5041 8 |  950 = 9719 6
 120 = 486F 7 | 540 = 576B 4 |  960 = 24A1 1
 130 = 9719 A | 550 = 57D9 2 |  970 = 9FBE 3
 140 = E0A0 9 | 560 = 3E3C 1 |  980 = 4F95 4
 150 = 9079 8 | 570 = E50E 7 |  990 = AD06 B
 160 = E5B9 2 | 580 = 9719 B | 1000 = 22DD 2
 170 = 5117 7 | 590 = 8FE6 C | 1010 = 9719 E
 180 =  960 E | 600 =  948 2 | 1020 = 7A2C A
 190 = 7B5E 0 | 610 = 87DE 3 | 1030 = E872 D
 200 = 9CFE 5 | 620 = 3E11 A | 1040 = E0E9 0
 210 = B945 F | 630 = ED0F F | 1050 = 90F2 4
 220 = 5CE1 E | 640 = 9719 F | 1060 = ED0F 6
 230 =  E7D 2 | 650 = 3FA5 6 | 1070 = 9719 5
 240 = F6A4 8 | 660 = 198D 4 | 1080 = 2EDA D
 250 = 3DDD C | 670 = 1078 1 | 1090 = E954 C
 260 = A9BD 1 | 680 =  2F5 A | 1100 = 92FF 7
 270 = 2A00 8 | 690 =  478 A | 1110 =  FA8 2
 280 = BF3A 3 | 700 = E579 D | 1120 = 2882 9
 290 = 9719 6 | 710 = AAB9 C | 1130 = 7219 B
 300 = 52FB 4 | 720 = 22DD D | 1140 = 2F0F F
 310 = 8C4A F | 730 = 9719 3 | 1150 = F8A7 C
 320 = 4F70 6 | 740 = D8D0 B | 1160 = 5F97 0
 330 = 31BB 1 | 750 = 7304 E | 1170 = 7F9A E
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 350 = 74D6 2 | 770 = D337 D | 1190 = 9719 6
 360 = 9719 1 | 780 = ED0F 6 | 1200 = 70F3 D
 370 = 6268 0 | 790 = 9719 9 | 1210 = 3358 F
 380 = FA51 F | 800 = C2A8 A | 1220 = 9719 D
 390 = E114 0 | 810 = 4ADE 2 | 1230 = 294C E
 400 = D4D7 D | 820 = A65F 0 | 1240 = EE3E C
 410 = 81D0 0 | 830 = 804D 6 | 1250 = ED0F 4
 420 = 29A2 D | 840 = CE3C E |
```
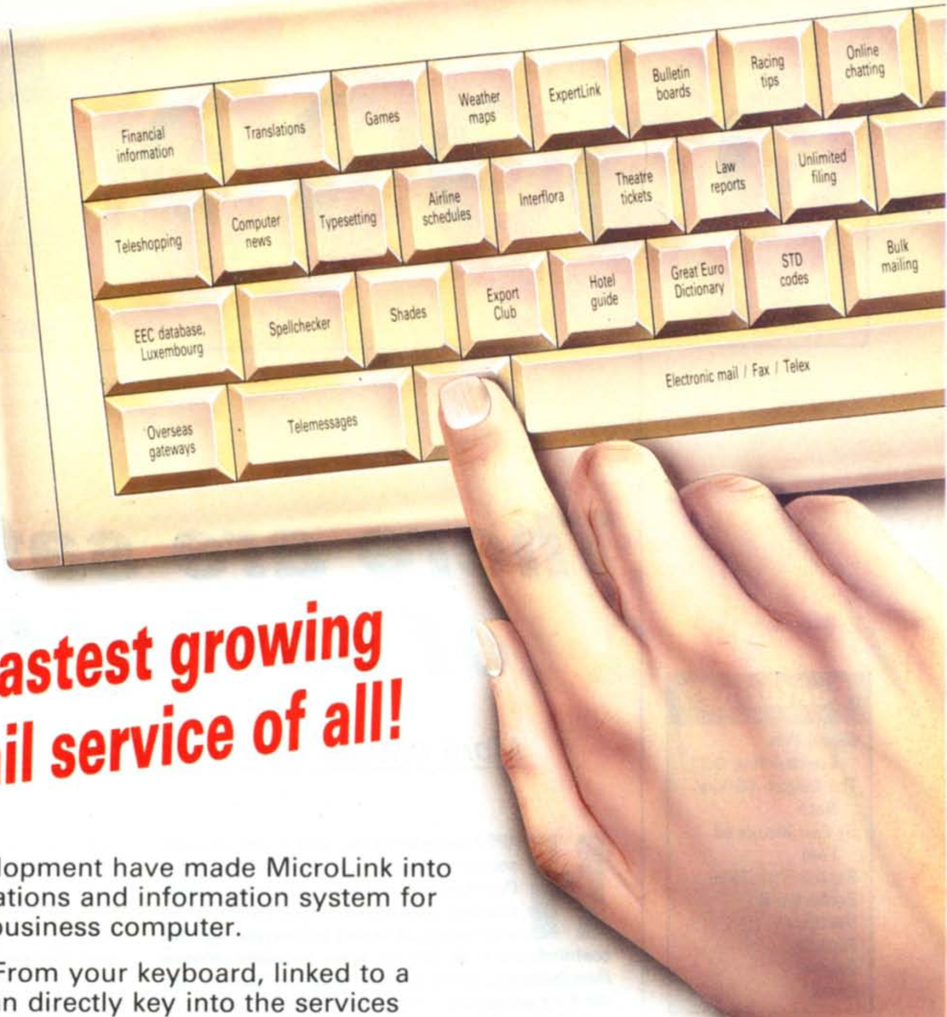

## DISPLAY LISTING

```
  10 REM Display
  20 REM by George Speller
  30 REM (c) The Micro User
  40 ON ERROR MODE7:PROCerror:END
  50 MODE7:PROCsetup
  60 MODE2:VDU23,1,0;0;0;0;
  70 PROCcolsoff
  80 PROCos("LOAD "+F$)
  90 REPEAT T%=TIME+5
 100 REPEAT UNTIL TIME>T%
 110 PROCrotate:UNTIL FALSE
 120 :
 130 DEFPROCrotate:*fx19
 140 VDU19,S%+E%,A%;0;
 150 VDU19,S%+L%,0;0;:*fx19
 160 VDU19,S%+4+E%,B%;0;
 170 VDU19,S%+4+L%,0;0;:L%=E%
 180 E%=(E%+1)MOD4:ENDPROC
 190 :
 200 DEFPROCsetup:DIM b%256
 210 S%=8:L%=0:E%=0:*FX4,1
 220 PRINTTAB(0,10)"Display"'
 230 INPUT"Load filename: "F$
 240 IF F$="" F$="SCREEN"
 250 PRINT'"Colour A (1-7)";:A%=FNn
 260 PRINT'"Colour B (1-7)";:B%=FNn
 270 ENDPROC
 280 :
 290 DEF FNn:REPEAT G%=GET-48
 300 UNTIL G%>0 AND G%<8:PRINT;G%:=G%
 310 :
 320 DEFPROCcolsoff:FORN%=8TO15
 330 VDU19,N%;0;0;:NEXT:ENDPROC
 340 :
 350 DEF PROCos($b%):LOCAL X%,Y%:X%=b%
 360 Y%=X%DIV256:CALL&FFF7:ENDPROC
 370 :
 380 DEF PROCerror:*FX4
 390 IF ERR=17 PRINT "Finished":END
 400 REPORT:PRINT" at line ";ERL:END
```

**Get it right!**

```
  10 =    0 0 | 150 = 4DDF C | 290 = DCFD A
  20 =    0 0 | 160 = 9346 5 | 300 =  B73 4
  30 =    0 0 | 170 = 2684 5 | 310 = 9719 9
  40 = B0C1 1 | 180 = 71B0 6 | 320 = 6E1D B
  50 = E9E7 5 | 190 = 9719 B | 330 = B746 7
  60 = 8029 E | 200 = FC9C 6 | 340 = 9719 8
  70 = 6240 3 | 210 = 85CF F | 350 = 4832 9
  80 = 63E3 D | 220 = 6A6B 3 | 360 = 3358 2
  90 = D09F 7 | 230 = 7D40 3 | 370 = 9719 4
 100 = 64BD 8 | 240 = F50A 3 | 380 = 294C F
 110 = 5873 6 | 250 = 9AFB F | 390 = 66B9 E
 120 = 9719 6 | 260 = 970C 1 | 400 = FA32 6
 130 =  3F3 C | 270 = ED0F 9 |
 140 = B08A 1 | 280 = 9719 A |
```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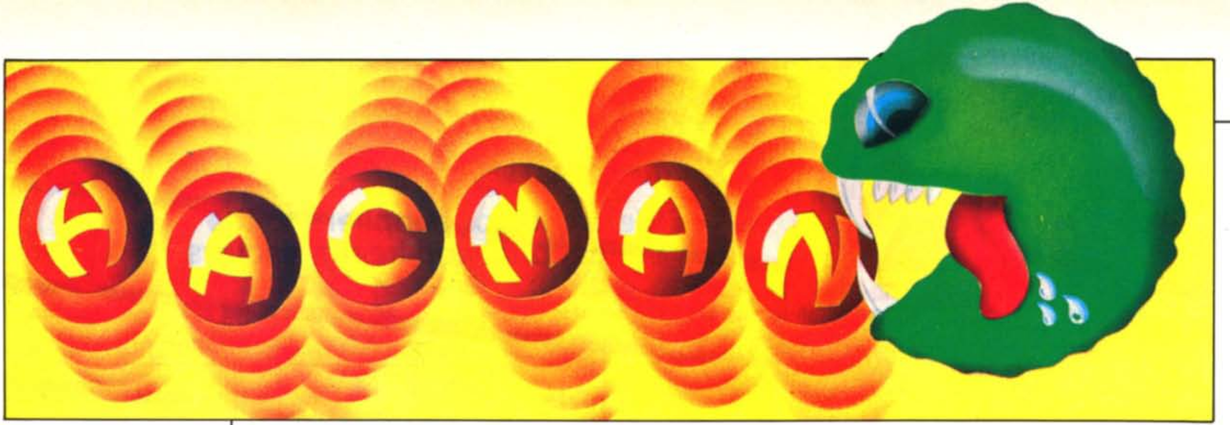

# There are safer ways of saving tracks

## More cheats from Hac Man – the king of games

**Featuring:**

- **Grand Prix Construction Set**
- **The Empire Strikes Back**
- **By Fair Means or Foul**
- **Repton Thru Time**
- **Barbarian II**
- **Deathstar**
- **Fireball**
- **Saigon**
- **Quest**

**HAPPY Birthday to me. This is the column's second birthday – as well as *The Micro User*'s sixth – and we're still young, chomping and bursting with ideas. I'd like to say a few words of thanks to everyone who has contributed over the last two years, including software manufacturers, game authors, Walt the Modem, Alix the filing system and most of all to you, the readers and contributors: Thanks to you all. That said, on with the show.**

Master Compact owners may remember a feature in the May 1988 column which explained how to save and load your own tracks on Superior's **Grand Prix Construction Set**. The problem was that the game did not perform a *MOUNT command to force the ADFS to read the disc catalogue before attempting to read or write data. The result was that if you replaced the game disc with a data disc, the ADFS didn't know and complained with a *Disc changed* error causing the program to crash.

The solution was to create a separate directory on the game disc itself. I stressed at the time that this was an extreme case and is by no means a hard and fast rule. It was only possible in this case because the hidden protected data was on an area of the disc that could not normally be accessed by the ADFS so you couldn't accidentally corrupt it by saving data.

As I always emphasise, writing data to an original program disc is not a good solution, and I have since received a letter from Mark Penney of Hadfield, Cheshire, with a method of saving tracks on to a separate disc.

When prompted for a filename simply enter $.*filename*. For example, to save a replica of the US Watkins Glen circuit just use $.WATGLEN. Entering *$.* before the required filename forces the ADFS to load, save or search using a path from the root directory – $. So it must check the physical root directory on the disc rather than using the currently selected directory held in ram. This has the effect of issuing a *MOUNT for you and so the *Disc changed* error is cleared.

However, the ADFS now thinks it is accessing the data disc when, in fact, we want to continue loading game code from the program disc. No problem, simply put the game disc back into the drive and press R to the question *RACE OR ABORT*. Once again the ADFS recognises the disc has been changed and crashes the program, displaying a few hexadecimal numbers and the

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## Time passes

Here is the complete list of passwords and edit codes for **Repton Thru Time**, sent in by Daniel Hobbs of Aston School.

| **Prehistory** | | **Egypt** | | **Victorian** | | **Now** | | **Future** | |
|---|---|---|---|---|---|---|---|---|---|
| PREHIST | 12345 | EGYPT | 8473 | VICTORI | 54066 | NOW | 54524 | FUTURE | 33776 |
| HEATERS | 16494 | FAVOURS | 5012 | MERCURY | 57950 | OCTAGON | 21370 | ORACLES | 1119 |
| HILLOCK | 29652 | HAPPENS | 48238 | CLEAVER | 62809 | CASTLES | 48417 | STAPLER | 36126 |
| PILFERS | 28265 | PERSONS | 2247 | BINDERS | 31463 | CHARLES | 4698 | DANCING | 46223 |
| MEDIATE | 25655 | CONQUER | 31761 | CONFUSE | 35584 | GREATER | 58449 | FANCIER | 48475 |
| COMPACT | 9761 | EVENING | 19495 | JINGLES | 10659 | BOOKLET | 23963 | BANANAS | 34409 |
| CARTOON | 43981 | MASTERS | 52592 | DOLPHIN | 45367 | FUNTIME | 64332 | EVEREST | 54136 |
| TUBULAR | 35862 | PIMPLES | 51035 | MINSTER | 23180 | SAVOURS | 29294 | KINGDOM | 53546 |

familiar *Disc changed* message. Now enter:

```
*MOUNT
*LOAD SOUND
*RUN RCCODE
```

and the rest of the game will load with your selected or newly designed track in place.

## Life after death

Repton aside, Superior is perhaps best known for its arcade adventures – Citadel, Palace of Magic and Exile spring immediately to mind. Another game in the same mould is **Quest** by newcomer Tony Oakden, released in the second quarter of last year.

Many modern games feature cheat modes, and Quest is no exception. However, most games don't advertise the fact. But Quest, on the other hand, details the cheat mode – a reincarnation facility – in the instructions but doesn't tell you how to activate it.

Help is at hand in the form of a cheat from D. Seymour from Cupar, Scotland: Press the keys R, E, I, N, C, A and T – the different letters that make up the word *reincarnate* – simultaneously. Now when you die you will be given the chance to reincarnate at your present position – but only four times.

## Great balls of fire

A number of Archimedes owners will be familiar with **Fireball**, the Breakout/Arkanoid/Impact game. I have not seen it, but apparently the development cheats printed in the instructions are incorrect. This piece of information comes from Simon Heather, the author of the game, so he should know what he's talking about. Over to Simon...

*To go to the next screen press Alt+. – full stop – on the numeric keypad. To jump to any wave press W+?+* on the keypad together then enter a number between 1 and 100. To alter the mouse*

**Turn to Page 62 ▶**

## Bigger and better

Regular readers may remember that I have featured routines to run the enhanced Master version of Stryker's Run on Model B machines fitted with the Solidisk 128k and Fourmeg 256k sideways ram boards or the Watford Electronics rom/ram board. I have also featured a routine to allow the Master version of Crazee Rider to run on the Solidisk Fourmeg board.

However, I have since received a letter from Chan Pheng Thaow of Hobart, Australia. He has installed a Peartree 128k sideways ram expansion board and a 65C02 processor in his BBC Micro, and would like to be able to run the enhanced Master version of Stryker's Run on his machine. Unfortunately I haven't seen the Peartree board; can anyone else help? If not Stryker's Run or Crazee Rider, then how about the Master versions of Exile, Repton Infinity, By Fair Means or Foul, Jet Set Willy II or Elite?

## Star spangled shoot-'em-up

Superior's **Deathstar** is a fairly old game now, but still a worthy blast for anyone intent on a quick bit of mayhem. It is a micro version of the Atari arcade machine game Sinistar and excellently reproduces that game's smooth 16-way screen scrolling. In fact, its author, Peter Johnson, wrote it as the official BBC Micro Sinistar but for some reason it was never released under that name.

The basic idea remains the same – you pilot your ship around the galaxy, mining crystals from the asteroids that float harmlessly around you. Once collected, the crystals act as Starbombs. However, two types of alien ship are out to stop you: The Workers also attempt to collect the crystals for assembly into the dreaded Deathstar. You can dispatch one of these with a single laser bolt and collect its crystal.

The other type, the Warrior, does not hesitate to shoot on sight. However, the real problems come when the Workers have finished building the Deathstar. It homes in on you relentlessly, causing obliteration on contact, and can only be destroyed with a full complement of Starbombs.

Fortunately, help is at hand – isn't it always – if you press Caps Lock+Control+Escape you will be promoted to the next level. You still have your current quota of Starbombs, but the Deathstar's progress is reset to zero, so that you have more time to collect the remaining crystals. Thanks to Reza Jugon of Wembley, Middlesex for this tip.

## Tequila top

**Tynesoft's *Saigon* is the first offering from Tequila, a name new to the BBC Micro games market. However, like the ones from many of the longer-established authors, Saigon features a built-in cheat mode which allows you to start on any one of the eight difficulty levels.**

**To activate it press Shift and a number key corresponding to the required start level – 1 to 8. While holding these two keys, press the spacebar. For example, to start on level five type Shift+5 then add the spacebar.**

◀ *From Page 61*

*sensitivity press < or >. The number opposite MS: on the screen will then change.*

Thank you very much Simon.

## Playing the game

J. Robbins of Acton Trussell, Staffs, has a very ungentlemanly tip for **By Fair Means Or Foul**. When you start, move back straight away to your own ropes – because the referee is less likely to see you perform any foul moves. When your opponent comes within range, kick him. If he manages to get closer, headbutt him repeatedly to push him back to kicking range and kick him again. By using these techniques repeatedly, you can usually achieve a knockout.

This tip is a bit below the belt but I'm sure it could easily be used as a kind of *level jump*. Simply cheat your way quickly to your desired starting level, then start playing fairly. Easy, really...

## Striking back

Diluk Dias of Harrogate, North Yorks, has sent me a letter regarding a cheat mode in Domark's **The Empire Strikes Back**. To obtain infinite shields press f6 and then press f0 on the little screen. The logos will turn green and the micro will display the message *The strength of the Force has been twisted to help a cheating coward*. So there.

Diluk discovered his cheat on the disc version of the game but any cheats that do not involve pokes normally apply equally to all versions. Diluk says that The Empire Strikes Back is far superior to Star Wars – I'd like to hear your opinion.

## Stop Press!

Many readers will have either seen or heard of Barbarian, Palace/Superior's hack-and-slay sword fighting game. I have just received a letter from Peter Scott, author of a number of Audiogenic's most successful games, notably the arcade adventures ThunderStruck and Omega Orb.

Peter is now working with Dylan, author of Barbarian I, and has taken on the daunting task of converting the follow-up, **Barbarian II**, for the BBC Micro. Peter also sent me a disc containing a pre-release version of it. Though still at a fairly early stage of development it looks as if the finished result will knock its predecessor for six. More next month, when I've had time to give it a once-over...

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# △ ...a fax machine and more

# △ FAX ·PACK·

With the ever increasing popularity of FAX machines this form of document communication is set to replace conventional postal deliveries with a fast, reliable, strike free, electronic mail service.

FAX PACK brings this world of facsimile document transfer to the Archimedes. By combining the facilities of a FAX machine with the power and flexibility of a computer, FAX PACK offers considerable benefits over conventional FAX systems.

FAX PACK basically allows any document, be it printed text or graphics, or an electronic document such as a word processor file, to be sent to FAX machines anywhere in the world, in seconds. This is done by scanning (digitising) the document and then sending it digitally over a normal phone line to the receiving FAX machine which re-constructs the image and then prints it.

## THE HARDWARE

The basic FAX PACK consists of a modem podule that plugs into any Archimedes computer, and the software to drive it. A variety of options are available such as scanners and power switching boxes.

The podule has connections for a scanner and power switching box (see below) and a conventional telephone line. An adapter is provided allowing a conventional phone to be paralleled with FAX PACK so that only one telephone line is required for both FAX and conventional use. However if a lot of FAX mail is going to be sent/received then a separate dedicated line is advisable.

FAX-PACK
sample page
FAX-PACK
FAX-PACK
FAX-PACK
FAX-PACK
FAX-PACK
FAX-PACK
Computer Concepts Ltd.

*Scanner & Sheet Feeder*

Unlike many normal FAX machines the hardware also provides both auto-answer and auto-dial facilities making it convenient and allowing completely automatic operation without human intervention.

## THE SOFTWARE

As part of FAX PACK this not only provides all the basic mechanisms for communicating with FAX machines but also includes high level WIMP based facilities for viewing FAXes on screen within a window, where they can be pixel edited, scaled, cropped, printed, etc.

This WIMP based software is simplicity itself to use so FAX PACK can be used in the office by staff with little or no computer experience. Of course unlike any conventional FAX machine FAXes can be viewed on screen, or filed away on disc for future reference without ever getting onto paper.

The software also allows text, word processed files, even graphics, to be automatically converted to a suitable FAX format for sending to other FAX machines. The paperless office becomes closer to reality since it is now possible to write articles, documents or letters and then send these directly to remote machines without involving paper.

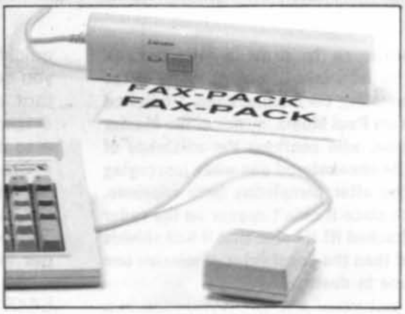
However facilities are also included for printing FAXes to a range of 9 and 24 pin dot matrix, inkjet and laser printers.

## SUPER FAST MODEM

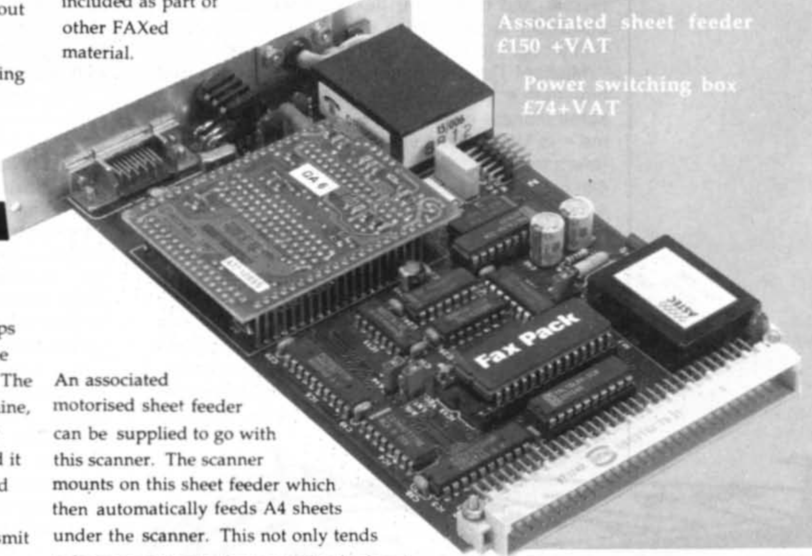
The FAX podule actually consists of a 9600 bps auto-answer, auto-dial modem, and so can be used for much more than just FAX transfer. The software can detect the type of remote machine, and if it finds a similarly equipped computer (rather than a FAX machine) at the other end it can then transfer ANY file fully error checked and glitch free. And by using some very advanced transmission protocols it can transmit data 4 times faster than most conventional modems on normal telephone lines.

## THE SCANNER

In order to send printed material it is necessary to digitise the page. An optional hand-held, A4 width, 200 dpi scanner can connect to the FAX podule. Being hand-held it is not only supremely compact, but it can digitise complete A4 pages, or pages from books or other awkward shaped documents.



Of course images scanned in this fashion are not only useful for FAX purposes but also for inclusion in word processor or desk top publishing programs. FAX PACK software allows company logos and signatures to be scanned, cropped and then included as part of other FAXed material.



An associated motorised sheet feeder can be supplied to go with this scanner. The scanner mounts on this sheet feeder which then automatically feeds A4 sheets under the scanner. This not only tends to be more accurate than scanning by hand, but is also more convenient.

## AUTOMATIC POWER SWITCH

This external power switching box can automatically switch the computer on in order to answer incoming FAXes. The FAX podule can then answer the phone, receive the FAX and file it to disc, and then switch the computer off again. The computer can therefore be switched off and left completely unattended for very long periods of time.

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B B+ M

# Playing the Generation Game

*Hi-tech adventure with the Mad Hatter*

**ELITE continues to draw a tremendous postbag, so let's take a look at a few of the most interesting communications. I received a letter from Paul Mama, owner of the Master 128 version, who confirms the existence of Generation Ships. He encountered one while journeying through the galaxies after completing both missions. He saw it by chance since it didn't appear on the radar – and the rotter attacked it! He said that it had shields even more powerful than the Constrictor of mission one and took a long time to destroy.**

You can see a picture of one when you load in a new Commander on the Master 128 version – something which gave John Devine some puzzlement.

J. Steadman wonders about the existence of asteroids on the disc version. They certainly are there and can be mined, but their arrival – like that of Thargoids – is one of the pseudo-random factors and unless he has attained Dangerous status he is unlikely to see many – they don't really begin to appear until you are Deadly.

Michael Quinlan mentions a friend who told him that a targeting computer is available on some planets once you are Elite. This is news to me – is Michael the victim of a leg-pull? He also refers to a shortage of asteroids, and asks if you can blow up a space station. The answer to that is simple: No.

Simon Parmenter, who has also encountered Generation Ships, has made some interesting observations. He agrees that combat in Turbo mode is extremely difficult and has encountered rock hermits – only available on Master 128 and second processor versions. As he says, they are almost indistinguishable from ordinary asteroids.

He offers a tip worth repeating: When encountering enemy ships you must destroy them as quickly as possible to conserve your shields. If you don't do this you *must* destroy the more distant ones first while absorbing hits from the closer pirates to help minimise damage. Simon also asks if anyone has seen a space dredger.

Graeme Couves has been conducting trading experiments with platinum which, like all items not measured in tonnes, is carried in your cabin and not in the cargo hold. He sold 91kg at Cr 74 per kilo and should have received an extra Cr 6734 to add to his total – making him worth Cr 644819.5 in all. The actual total shown was Cr 638265.9 – a shortfall of Cr 6553.6 – or 2 to the 16th power over 10 – which suggests to him that a bit is not being carried forward and added into the credit total. My advice, therefore, is to stay out of platinum unless you fancy rewriting the code.

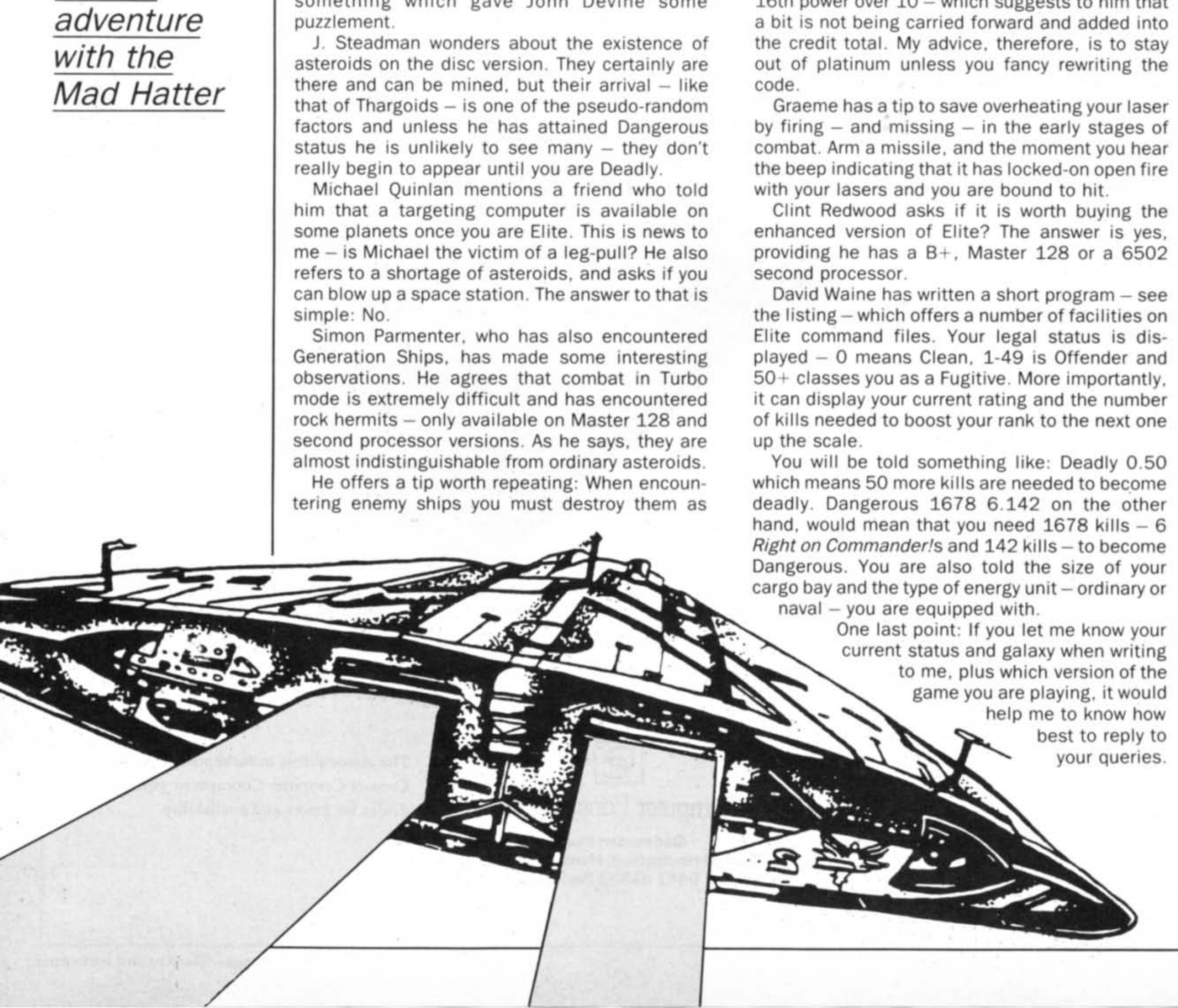
Graeme has a tip to save overheating your laser by firing – and missing – in the early stages of combat. Arm a missile, and the moment you hear the beep indicating that it has locked-on open fire with your lasers and you are bound to hit.

Clint Redwood asks if it is worth buying the enhanced version of Elite? The answer is yes, providing he has a B+, Master 128 or a 6502 second processor.

David Waine has written a short program – see the listing – which offers a number of facilities on Elite command files. Your legal status is displayed – 0 means Clean, 1-49 is Offender and 50+ classes you as a Fugitive. More importantly, it can display your current rating and the number of kills needed to boost your rank to the next one up the scale.

You will be told something like: Deadly 0.50 which means 50 more kills are needed to become deadly. Dangerous 1678 6.142 on the other hand, would mean that you need 1678 kills – 6 *Right on Commander!*s and 142 kills – to become Dangerous. You are also told the size of your cargo bay and the type of energy unit – ordinary or naval – you are equipped with.

One last point: If you let me know your current status and galaxy when writing to me, plus which version of the game you are playing, it would help me to know how best to reply to your queries.



```
   10 REM Elite Commander Display
   20 REM by David Waine
   30 REM (c) The Micro User
   40 MODE7:DIM kl(13),rt$(13),b%&400
   50 DATA 0,Harmless,8,Mostly harmless
   60 DATA &10,Poor,&20,Average
   70 DATA &40,Above average,&80,Compete
nt
   80 DATA &200,Dangerous,&A00,Deadly
   90 DATA &1900,Elite,&3200,Elite (x2)
  100 DATA &4B00,Elite (x3),&6400,Elite
(x4)
  110 DATA &7D00,Elite (x5)
  120 FOR A=1TO13:READ kl(A),rt$(A):NEXT
  130 ON ERROR PROCerr
  140 FOR A%=0TO1:VDU 31,0,A%,129,157,13
1,141,31,12,A%:PRINT"COMMANDER DISPLAY":
NEXT
  150 VDU 28,0,24,39,2:REPEAT REPEAT CLS
  160 PRINTTAB(0,2)CHR$129+"Enter filena
me:"+CHR$131;
  170 INPUTf$:UNTIL LENf$<8 AND f$>""
  180 PRINTTAB(0,3)CHR$129"Which drive:"
CHR$131;
  190 REPEAT dr%=INSTR("0123",GET$)-1
  200 UNTIL dr%>=0:PRINT;dr%
  210 f$=":"+STR$dr%+".E."+f$
  220 O%=OPENINf$:IF O%>0 CLOSE#O%
  230 IF O%=0 PRINTCHR$133"File ""f$"" n
ot found...":IFGET
  240 UNTIL O%>0
  250 PROCoscli("LOAD "+f$+"+STR$~b%)
  260 B%=b%?&48:REM RoCs
  270 C%=b%?&47:REM Remainder of kills
  280 A%=B%*256+C%:REM Total kills
  290 D%=b%?&34:REM Legal points
  300 E%=b%?&16-2:REM Cargo bay size
  310 F%=b%?&2B:REM Energy unit type
  320 CLS:PROCdisplay:PROCratings
  330 PROCkills_needed:PROCrocs_needed
  340 PROCrerun:RUN
  350 DEF PROCdisplay
  360 PRINTTAB(0,1)CHR$129"Commander:"CH
R$131f$
  370 PRINTTAB(0,2)CHR$129"Legal Status:
"CHR$131FNlegal" (";D%")"
  380 PRINTTAB(0,3)CHR$129"Energy Unit:"
CHR$131FNenit
  390 PRINTTAB(0,4)CHR$129"Cargo Bay Siz
e:"CHR$131;E%" tonnes"
  400 PRINTTAB(0,5)CHR$129"Rating:"CHR$1
31FNrating
  410 PRINTTAB(0,6)CHR$129"Right on Comm
anders:"CHR$131;B%".";C%
  420 PRINTTAB(0,7)CHR$129"Total Kills:"
CHR$131;A%
  430 ENDPROC
  440 DEF PROCratings:FOR A=1 TO 13
  450 PRINTTAB(0,A+8)CHR$129rt$(A)
  460 NEXT:ENDPROC
  470 DEF PROCkills_needed:FOR A=1 TO 13
  480 PRINTTAB(21,A+8);FNkill(kl(A))
  490 NEXT:ENDPROC
  500 DEF PROCrocs_needed:FOR A=1 TO 13
  510 PRINTTAB(28,A+8);FNroc(kl(A))".";F
Nroc1(kl(A))
  520 NEXT:ENDPROC
  530 DEF PROCrerun
  540 PRINTTAB(10,23)CHR$131"Rerun (Y/N)
?";
  550 REPEAT A%=INSTR("YyNn",GET$)
  560 UNTIL A%:IF A%>2 CALL!-4
  570 ENDPROC
  580 DEF FNrating:FOR A=2 TO 13
  590 IF A%<=kl(A) r$=rt$(A-1):A=13
  600 NEXT:=r$
  610 DEF FNlegal:IF D%=0 ="Clean"
  620 IF D%>0 IF D%<50 ="Offender"
  630 ="Fugitive"
  640 DEF FNroc(N%):X%=N%-A%
  650 IF X%<0 =0 ELSE =X%DIV256
  660 DEF FNkill(N%):X%=N%-A%
  670 IF X%<0 =0 ELSE =X%
  680 DEF FNroc1(N%):X%=N%-A%
  690 IF X%<0 =0 ELSE =X%MOD256
  700 DEF PROCerr:VDU26,12
  710 REPORT:PRINT" at ";ERL:END
  720 DEF PROCoscli($&700):LOCAL X%,Y%
  730 Y%=7:CALL&FFF7:ENDPROC
  740 DEF FNenit:IF F%=0 ="Not Present"
  750 IF F%=1 ="Normal"
  760 IF F%=2 ="Naval" ELSE ="Cheat"
```

**Get it right!**

```
 10 =    0 0 | 270 = CD13 0 | 530 = 64B5 C
 20 =    0 0 | 280 = AAEF 3 | 540 = 6B9F D
 30 =    0 0 | 290 =  12A B | 550 = AEE6 1
 40 = 166F F | 300 = 2E9A 2 | 560 = 330F 6
 50 = 8793 6 | 310 = 4A6F 2 | 570 = ED0F 7
 60 = 49B9 3 | 320 = C803 4 | 580 = 5DAE 9
 70 = 3E34 B | 330 = 149B 3 | 590 = E33A D
 80 = 1418 A | 340 = 8987 A | 600 = D31D E
 90 = 6A9A 4 | 350 =  2FC 2 | 610 = 6AD7 3
100 = 2CA2 2 | 360 = D950 9 | 620 =  16F D
110 = E77D 9 | 370 = BBA2 7 | 630 = D775 7
120 = 4187 0 | 380 = 5E73 0 | 640 = D28F C
130 = 2D1B D | 390 = C028 B | 650 = 69D5 0
140 = 95EC 1 | 400 =  B31 B | 660 = FD68 6
150 = BAA3 1 | 410 = D712 3 | 670 = D6F8 9
160 = A132 F | 420 = 76CF 6 | 680 = 6B15 9
170 = B0D1 7 | 430 = ED0F C | 690 = 84BD C
180 = 436F F | 440 = 2402 5 | 700 = E1FD 5
190 = AE58 A | 450 = B4A0 5 | 710 =  532 0
200 = A43E 7 | 460 = E531 6 | 720 = 1C6E 7
210 = F8DF 2 | 470 = 6E6D 4 | 730 = 50E0 E
220 = 9F78 C | 480 = CACE 6 | 740 = 17B7 9
230 = 1930 D | 490 = E531 E | 750 = DCAF 9
240 = 10C6 8 | 500 = 9E3F B | 760 = E1C5 E
250 = D3B0 8 | 510 = C129 2 |
260 = B268 0 | 520 = E531 7 |
```

## Twin Kingdom Valley

After you have deposited your treasures in the cabin – see last month's issue – return to the gold door either via the grating in the forest or Watersmeet, pass through and go east to the bronze door.

As long as you have the amulet the Forest King's daughter will recognise you when you unlock and open it. Leaving her prison cell thankfully, she tells you to go and see her father, the King, to gain a reward. Before you do this, however, drop the amulet and enter the Desert King's castle and fill up the lamp with oil from the workshop. Then go back along the passage to the armoury, killing the large guard along the way.

Now visit the Forest King and collect your reward – the silver key. Use it to unlock the secret door in the bones room and retrieve the diamond which you should take and leave in the cabin along with the brass key.

Retrace your steps to the armoury in the Desert King's castle, making sure that you shut the door behind you. It's time to select weapons and you'll find the axe – which you should already have – is best, followed by the broadsword and mace.

It's not a bad idea to take something along with you ready for the giant but, whatever you do, keep this friendly monster from gaining access to the armoury or he'll clutter himself up with every weapon in sight and nullify his use as a porter.

You should now attack the inmates of the castle, killing them and the King, and remove their weapons to a place of safety. The best thing is to lock them inside the armoury. Now you can liberate the giant safely.

Return along the cellar passages and down to the damp hall near where you released the Princess. Open the remaining locked bronze door and enter the dungeon.

On finding the ill giant, take him through the house to Watersmeet – he'll swim here and become the healthy giant. He is of supreme utility in carrying heavy objects, so give him a minor weapon and take him back to the Desert King's castle ready for some pillaging – which we'll deal with next month.

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◀ From Page 67

## Hatter's Helpline

Once more Barbara Gibb comes to the rescue of a reader – Gollum, this time – who was stuck in **Valley of the Kings** and **Castle Blackstar**. In the first pyramid, the last few moves from the evil-smelling chamber are TAKE DIAMOND – size of a duck's egg – S, W, S, S and W to a dead end. There's an egg-shaped hole here, so INSERT DIAMOND in order to be dropped into a chamber below, TAKE LAMP and PRAY to be teleported back to the oasis.

When you've collected the items you think you'll need for the second pyramid, simply go S and S from the oasis to inside pyramid. Incidentally, writes Barbara, leave the flask behind before entering the first pyramid or you won't be able to collect all the treasures – but *do* DRINK before entering.

In **Castle Blackstar** – an adventure she rated very highly – the broomstick is used to transport you at the end of the adventure to heaven and the goddess. Don't overload it: You only need the orb and the broomstick. EXAMINE PLAQUE on the broomstick and the magic word needed to operate it is hidden in the answer. You can now fly up, and you should continue until you can TOUCH STARS. Then you can progress until you meet the goddess.

The vase is not accessible from the woodland side of the grating. A tunnel from one of the cells in the cell block leads to the grating which can be opened using the winch – a useful additional entrance and exit. The orb is, naturally, in the orb room – located at the end of a maze which can be found by going DOWN from the warm room between the laboratory and the dragon room.

Graeme Couves asks about a wargame he encountered on a VAX 11/780 called **Empire** and wonders if a BBC Micro version exists. I don't know of any, but if Graeme has access to an Archimedes equipped with PC emulator I'd strongly recommend **Star Fleet 1** which I reviewed recently. Graeme is having a spot of bother in the fish room in **Kingdom of Hamil**. He, quite rightly, switches off the torch to discover the word SWAMP, but the roof falls in if he types it. That's because he *should* be typing OPEN.

Menno Nijland, from The Netherlands, is stuck in the goblins' dungeon in **The Hobbit** – as most of us have been at some time or another. He should wait for Gandalf or Thorin, then ask him to break open the trapdoor – discovered by digging – to get the key which is essential to the endgame. Next he should say CARRY ME, ask him to open the window and go through it. After that, Menno *must* find the ring before proceeding further.

## Problem Corner

**F. R. Harvey has struck a problem in the reissued version of Elite. He writes: I find that there is no way in which I can reach the planet Birera because this and its sister planets Ordiesat, Ribiara, Ersodi and Lelebi are all outside the seven light year range of any other possible jump off point. Thus I cannot complete the mission.**

**Suggestions and comments are welcomed.**

**James Hardwood has problems with two adventures that are unknown to me: In *Time Machine* he can't get out of the moors and in *Gideons Gamble* he just says he can't get very far. Can any reader help – either specifically, or with full solutions?**

## L and back

Continuing from last month, when you reach the boiler room you are faced with two choices, writes Bill Hensman. Down takes you to a passage moving E, and E from there brings you to a door with four locks and also key blanks and files. If you enter GET FILE or GET BLANK you will be asked if you want to cut a key. The response Y produces a picture of four keyholes and a key-blank plus instructions for cutting it.

The key you need is the mathematical intersection of the four shapes and it is best to draw it out on paper first. When you have cut it successfully you can UNLOCK DOOR and pass through. You can also reach this point from another direction, as we'll see later.

Back at the bottom of the stairs, you can now follow the main route in the game: Go up to the boiler room, up again to the top of the stairs and E to a room with a swimming pool. Then go E again to an orange lobby with a locked door – Bill says he's never found a key for it. East from the orange room takes you to the music room where you type PLAY PIANO and get the response *OK*. You have to play part of *Three Blind Mice* on the qwerty keys. The sequence is EWQEWQTREE then press Return.

The tune will now be completely replayed and you'll be given a bottle and a phial – but don't take them just yet. Leave the key here also, for use later. From here E takes you to the solarium and E again to a room with an elliptical billiard table. Although you can have fun here there's nothing to be gained by lingering too long.

● *To be continued...*

# U·P·D·A·T·E

## Education grants scheme storm

EDUCATIONAL software manufacturers have attacked a government grants scheme, claiming it could put them out of business. But the outburst has brought criticism of their industry from a government spokesman.

The manufacturers have called for more contact with Whitehall so they can plan ahead to be in a competitive position in Europe and they warn that if government help is not given it could spell the end of the British educational software industry.

Mike Matson of 4Mation Educational Resources (082 581 2679) and Bill Bonham of Sherston Software (0666 840 086) enlisted the help of shadow secretary of state for trade and industry Bryan Gould in their "Save our Educational Software Industry" campaign. They also involved Labour education spokesman Jack Straw.

Their action followed the government's offer of £1m in grants to help schools and local authorities buy educational software. The Department of trade and industry grants covered one third of the cost of buying software over an initial three month period ending in January, but were restricted to 16 and 32 bit machines.

Taking up the campaign, Bryan Gould asked trade and industry secretary Lord Young to increase the scope of the scheme to cover 8 bit machines and also to extend the time scale.

Replying for Lord Young, DTI Minister Eric Forth said the timescale of the scheme had been extended to February, but requests to include 8 bit software had been denied.

"Many argue that the British educational software industry is fragmented, inefficient and unprofitable, perhaps partly because it has been shielded from competition by several years of government subsidy", said Mr. Forth. "Indeed, some would argue that the industry has been too slow to bring our new 16 and 32 bit software to run on the excellent modern micros now marketed by British companies like Acorn". He said that if the current grants encouraged schools to buy foreign software it would be an indictment of the British industry.

Mike Matson said: "What upsets us considerably is that if this scheme had been hugely successful it could have killed off the educational software industry in this country. If local authorities had spent all their money on 16 and 32 bit software over the three months, educational software producers who are still doing 8 bit would have had no income for that period. We are very small companies and that three months would have finished us off completely.

"There are only a few of us in educational software and we have not gone into 16 and 32 bit because we feel the market is not there at the moment, particularly in primary schools. The time limits imposed on the grants were just not sufficient to allow new software to be produced.

"We need to know what the government is going to do – whether it is going to push for the Master and Archimedes or retain support for 8 bit and we need to know 12 months in advance. We are mostly on the scale of cottage industries and cannot commit months of development work to

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*Shadow secretary of state for trade and industry Bryan Gould has taken up the software writers' campaign*

*"If this scheme had been hugely successful it could have killed off the educational software industry in this country"*

## MUSE conference

MUSE (Micro Users in Education), the national body for coordinating information technology in schools, will hold its annual conference at Nottingham University from July 24 to 26.

Featuring strongly at the conference will be the national curriculum and its effects on information technology. MUSE delegates have already contributed to a government sponsored conference on IT in the new curriculum. It is also hoped to have a number of sessions arranged by MUSE's sister organisation BLUG, the British Logo Users' Group.

"Deeds not words" will be the theme of the conference with a practical, lively and down to earth approach and plenty of machines in evidence.

At its meetings, MUSE promotes the exchange of information and ideas and also runs courses on all aspects of hardware and software for learning. It can be contacted on 0533 433839.

◀ From Page 69

one machine if the market is not going to be there in the end".

His words were echoed by Bryan Gould, who told Lord Young that without a long term government response, worked out with the industry, to convert British software for the new generation of school micros and to develop it for export markets, Britain is in danger of losing an important knowledge-based industry almost entirely composed of small businesses.

He said there is also the threat of overseas software, particularly from Holland where the government is pumping 26 million guilders into a project to produce 54 educational courseware packages. "These will be marketed in Britain with catalogues already available and could well swamp the market here in the run up to 1992", said Mr. Gould.

Latest figures available from the DTI showed the scheme had prompted local authorities to buy £780,000 worth of software with a further £80,000 in the pipeline for independent schools and teacher training colleges. This accounted for £286,000 of the £1 million available.

> *It is very refreshing to find software which is designed for the age range on the label*

## Hampshire goes for Archimedes

HAMPSHIRE Local Education Authority has approved the purchase of more than 1,000 Archimedes to equip its 114 secondary schools and sixth form colleges.

## Cheaper connection

HUMAN-Computer Interface Ltd (0223 314934) has announced bulk purchase deals for its BBC Connectivity products. Schools or other educational buyers can now get discounts if they buy 10 or more items.

Under the new deal, View Mac Version 2 for document conversion between BBC Micro and Macintosh drops from a single copy price of £67.85 to £54.28 for bulk order. Screen Mac for graphics conversion between BBC Micro and Macintosh drops from £56.35 to £45.08. There are similar cuts for the company's SC1 and SC2 serial transfer cables.

## Children go for Fun School 2

TEACHERS have applauded Fun School 2 from Database Educational Software (0625 878888), now available on the BBC range of micros.

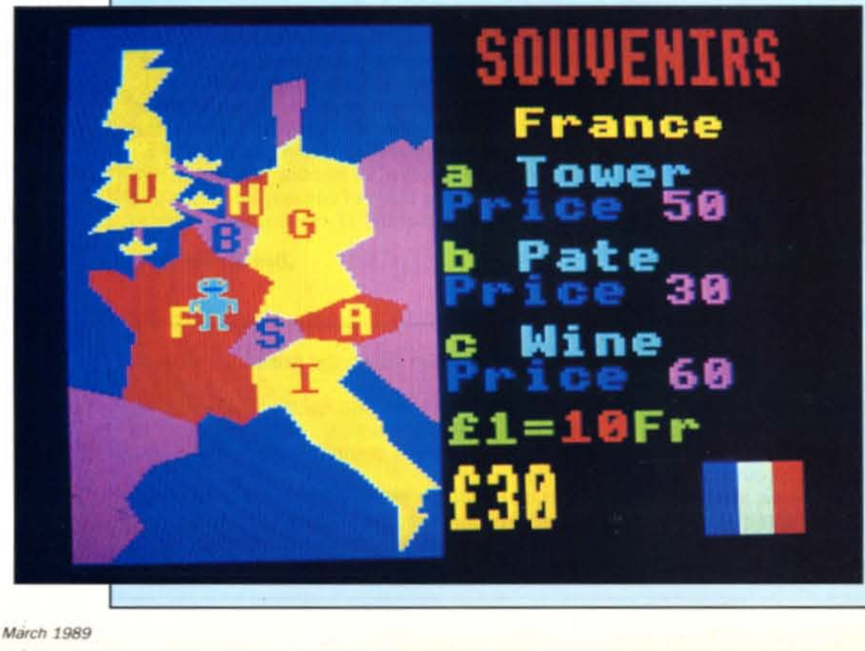
"Fantastic", was the opinion of Shelley Gibson, a primary teacher in Tameside whose opinions are shared by other educationalists.

"It is very refreshing to actually find software which is designed for the age range on the label", she said. "The reception and nursery classes are often the most difficult to find appropriate material for but this is ideal. It is hard to keep the children off it. They are so keen that time with Fun School is often used as a classroom reward".

The Fun School 2 package is available in three versions for children under six, six to eight and over eight. For the under sixes there is a suite of eight programs designed by educationalists to combine fun with a wide range of early skills.

The six to eight programs are designed to allow various levels of difficulty covering word and number work, coordination and logical thinking.

In the over eights section, Fun School 2 combines the challenge of a larger adventure game with the convenience of a series of short puzzles. Seven of the games are self-contained and the eighth can only be solved using keywords obtained by successfully completing the seven others.



*Souvenirs: One of the Fun School 2 programs designed for over eights*

# B & S

# COMPUTING

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## Computers and Upgrades

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|---|---|
| Archimedes 305 | £569.00 (a) |
| Archimedes 305 Mono System | £759.00 (a) |
| Archimedes 305 Colour System | £919.00 (a) |
| Archimedes 310 | £835.00 (a) |
| Archimedes 310 Mono System | £895.00 (a) |
| Archimedes 310 Colour System | £1055.00 (a) |
| Archimedes 310M | £895.00 (a) |
| Archimedes 310M Mono System | £955.00 (a) |
| Archimedes 310M Colour System | £1115.00 (a) |
| Archimedes 440 | £2529.00 (a) |
| Archimedes 440 Mono System | £2589.00 (a) |
| Archimedes 440 Colour System | £2749.00 (a) |

**NEW FOR 1989 – SPECIAL PACKAGE PRICES
AND DEALS ON ALL ARCHIMEDES – 0%
FINANCE, SOFTWARE etc.
PHONE OUR SALES STAFF FOR DETAILS**

| | |
|---|---|
| Archimedes podule backplane | £39.00 (d) |
| Archimedes ROM podule | £59.00 (d) |
| Archimedes I/O podule | £85.00 (d) |
| Archimedes Midi add-on to I/O podule | £39.00 (e) |
| Archimedes Midi podule | £69.00 (d) |
| Master 128 | £369.00 (a) |
| Master Compact | From £310.00 (a) |
| Master Turbo Upgrade | £110.00 (c) |
| Master 128 Eprom Cartridge | £11.00 (c) |
| Master 128 Dust Cover | £4.50 (e) |
| Compact RS 232 Interface | £26.00 (c) |
| Compact TV Modulator | £26.00 (e) |
| 1770 Disc Interface | £45.00 (d) |
| ADFS ROM (B+ or B with 1770) | £25.00 (e) |
| B+64 64K Upgrade | £30.00 (d) |
| Trade in your old Model B against a new Master 128, Master Compact or Archimedes | |
| Cambridge Computers Z88 | £244.00 (a) |
| Z88 PSU | £8.65 (d) |
| 128K RAM | £43.00 (e) |
| 128K Eprom | £43.00 (e) |

**ATARI & COMMODORE – Now available
Phone for latest offers**

## Printers (Dot Matrix)

| | |
|---|---|
| Citizen 120D 80col/120cps + 25cps NLQ | £130.00 (a) |
| Citizen MSP15E 136col/160cps + 40cps NLQ | £230.00 (a) |
| Citizen MSP40 80col/200cps + 50cps NLQ | £300.00 (a) |
| Citizen MSP45 136col/200cps + 50cps NLQ | £390.00 (a) |
| Citizen MSP50 80col/250cps + 60cps NLQ | £390.00 (a) |
| Citizen MSP55 136col/250cps + 60cps NLQ | £515.00 (a) |
| Citizen HQP40 24pin 80col/200cps + 60cps LQ | £369.00 (a) |
| **Citizen HQP45 24pin 136col/200cps + 60cps LQ Special** | **£350.00 (a)** |
| Star LC10 120cps + 30cps NLQ | £199.00 (a) |
| Star ND10 80col/180cps + 45cps NLQ | £320.00 (a) |
| Star ND15 136col/180cps + 45cps NLQ | £380.00 (a) |
| Star NR10 80col/240cps + 60cps NLQ | £395.00 (a) |
| Star NR15 136col/240cps + 60cps NLQ | £460.00 (a) |
| Star LC24-10 80col/142cps + 47cps LQ 24pin | £305.00 (a) |

## Printers (Laser)

| | |
|---|---|
| Citizen Overture 110+ 10pages/min | £1390.00 (a) |
| Star Laser Printer 8 8 pages/min | £1700.00 (a) |

All laser printers with1 year on site maintenance

## AMX Mouse and Software

| | |
|---|---|
| AMX Mouse + Super Art | £60.00 (d) |
| AMX Pagemaker | £37.00 (d) |
| Extra Extra | £21.00 (e) |
| Mouse Mat | £4.34 (e) |

## Disc Drives

**Mitsubishi Drives**

| | |
|---|---|
| Single DS 40/80T | £96.00 (a) |
| Single DS 40/80T inc PSU | £111.00 (a) |
| Dual DS 40/80T | £189.00 (a) |
| Dual DS 40/80T inc PSU | £209.00 (a) |
| Dual DS 40/80T inc PSU & Plinth | £214.00 (a) |
| 20Mb Winchester | £449.00 (a) |
| Combination 3.5 5.25 Winchester available | Phone for details |

2 year Warranty on all Drives

## Discs

**Discs 5.25" (Boxed in 10's Lifetime guarantee)**

| | |
|---|---|
| 3M744 SS/DD 48TPI | £8.00 (d) |
| 3M745 DS/DD 48TPI | £9.00 (d) |
| 3M747 DS/DD 96TPI | £13.00 (d) |

Add £1 for plastic library case

| | |
|---|---|
| B & S Label 96TPI in see through LIB. Case DS/DD | £10.00 (d) |
| Disc Cleaning Kit (state 5.25" or 3.5") | £5.00 (d) |

**3.5"**

| | |
|---|---|
| 3M 35SS SS/DD (Box of 10) | £13.00 (d) |
| 3M 35DS DS/DD (Box of 10) | £16.00 (d) |
| B & S Label DS/DD | £13.00 (d) |

**Lockable Anti-Static 5.25" Storage Cases**

| | |
|---|---|
| 50 Disc Capacity | £8.00 (d) |
| 100 Disc Capacity | £10.00 (d) |

## Monitors

**All Monitors include BBC Lead**

| | |
|---|---|
| BM 7502 (Green) Hi-Res Mono Monitor with Audio | £69.00 (a) |
| Philips Colour Monitor RGB, Composite Video, Audio in Linear RGB Green Screen SwitchableBBC/IBM Compatible CM8833 | £220.00 (a) |
| Philips Multisync CM8873 CGA/EGA/PGA Compatible | £520.00 (a) |

Ideal for use with Acorn Archimedes computers.

**Microvitec**

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|---|---|
| 1431 (Metal or Plastic Case please specify) Std. Res. | £184.00 (a) |
| 1451 (Metal or Plastic Case please specify) Med Res. | £229.00 (a) |
| 1441 (Metal or Plastic Case please specify) High Res. | £379.00 (a) |
| 1431 AP Metal Case RGB and CV/Audio Std. Res. | £209.00 (a) |
| 1451 AP Metal Case only RGB and CB Audio Med. Res. | £259.00 (a) |
| TILT and SWIVEL Stands for Plastic Case Only | £19.00 (a) |

**Plinths**

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|---|---|
| BBC B Single | £11.00 (c) |
| BBC Master Single | £12.00 (c) |
| BBC Master with Shelf | £22.00 (b) |

UK Customers: Please add 15% VAT to all prices (including carriage). Government and educational establishments official orders welcomed. When ordering please enclose a cheque or postal order for the appropriate amount, UK Carriage Rates (a) £8.00 – courier insured delivery (b) £3.50 (c) £2.50 (d) £1.50 (e) £1.00. All prices are correct at time of going to press. All offers are subject to availability, all prices are subject to change without prior notification and are available on request. Current price list is available on request. Goods normally despatched on receipt of order.

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## ROM Boards

| | |
|---|---|
| ATPL Sideways Model B | £35.00 (d) |
| ATPL Sideways Model B+ | £31.00 (d) |
| Viglen Spare Cartridges | £2.50 (e) |

## Peartree Products

| | |
|---|---|
| MR5000 Master ROM Cartridge | £8.95 (e) |
| MR6000 Master ROM Cartridge | £11.95 (e) |
| MR7200 Master RAM Cartridge | £33.95 (e) |
| MR8000 Master RAM Cartridge | £49.95 (e) |
| MR3000 Mini ROM Board BBC B only | £15.95 (e) |
| MR4300 Mini ROM/RAM Board BBC B only | £39.95 (e) |
| MR4800 Mini RAM Board BBC B only | £89.95 (d) |

## Printer Ribbons and Accessories

| | |
|---|---|
| Epson LX 86 (Compat) | £2.50 (e) |
| Epson MX 80/RX 80/FX80/FX/85 (Compat) | £3.00 (e) |
| Juki 5510/Citizen MSP 20 (Compat) | £3.00 (e) |
| Citizen 120D/LSP10 | £3.75 (e) |
| Taxan 810/Canon (Compat) | £3.75 (e) |
| Juki 6100 Multistrike | £2.30 (e) |
| Tally MT85 Fabric | £5.00 (e) |
| Tally MT85 Carbon | £7.00 (e) |
| Printer lead 1.5m B/B+/M128/ELK +1 | £6.00 (e) |
| Printer lead 1.5m Compact | £8.00 (e) |
| Printer lead 1.8m IBM or Compatible + Archimedes | £10.00 (d) |
| 80col Printer Stand with Paper shelves | £29.00 (c) |
| Printer Switch Box 2 Way "T" Switch | £34.00 (c) |

## Modems

**All Modems inc BBC Lead**

| | |
|---|---|
| Miracle WS2000 | £95.00 (c) |
| Miracle WS4000 Hayes compatible | £144.00 (c) |
| Pace Nightingale + Commstar II | £94.00 (c) |
| Pace Commstar II ROM | £28.00 (e) |
| Pace Linnet | £124.00 (c) |
| Pace Series 4 2123S | £230.00 (a) |
| 50ft. Telephone Extn. Cable on Wind up Reel | £9.50 (d) |

## Software

**Acorn Soft**

| | | | |
|---|---|---|---|
| Micro Prolog | £50.00 (d) | ISO Pascal | £42.00 (d) |
| Logo | £44.00 (d) | BCPL | £39.00 (d) |
| View Printer Driver (D) | £8.00 (e) | Comal | £32.00 (d) |
| Lisp | £33.00 (e) | Hi View | £37.00 (d) |
| View Professional | £75.00 (c) | View 3.0 | £39.00 (d) |
| Viewsheet | £37.00(d) | View Store | £37.00 (d) |
| View Spell (80T only) | £29.00 (d) | View Plot | £21.00 (e) |
| View Index | £10.00 (e) | Overview | £69.00 (c) |
| Word Plus (Arch) | £75.00 (c) | Logistix (Arch) | £95.00 (d) |

**Computer Concepts**

| | | | |
|---|---|---|---|
| Interword | £39.00 (d) | Inter Sheet | £39.00 (d) |
| Interchart | £26.00 (d) | Interbase | £49.00 (d) |
| Mega 3 | £75.00 (c) | Spellmaster | £42.00 (d) |
| Wordwise | £30.00 (c) | Wordwise + | £37.00 (d) |

**All latest Archimedes Software (inc. Games) – Now in stock**

**Mirrorsoft**

| | | | |
|---|---|---|---|
| Fleet Street Editor | £31.00 (d) | Fonts and Graphics | £11.75 (e) |

**Clares**

| | | | |
|---|---|---|---|
| Fontwise + | £16.00 (e) | Replica III | £11.00 (e) |
| Artisian (Arch) | £31.00 (e) | Artisian Support | £16.00 (e) |

| | |
|---|---|
| VINE MICRO REPLAY (State M/C and Disc Interface) | £30.00 (e) |

**NB It is essential to state machine and 40/80T
when ordering software**

## Books (No VAT on Books)

| | | | | | |
|---|---|---|---|---|---|
| Master Ref. Manuals Pt1 | £14.00 (d) | Pt2 | | | £14.00 (d) |
| Advanced Master Ref. Manual (Bray & Dickens) | | | | | £19.95 (d) |
| Lisp | £8.00 (e) | Forth | £8.00 (e) | ISO Pascal | £8.00 (e) |
| BCPL | £14.00 (d) | View Guide | £6.00 (e) | Into View | £6.00 (e) |
| View 3 | £9.00 (e) | View Sheet | £9.00 (e) | View Store | £9.00 (e) |
| Archimedes Ref. Manual | | | | | £29.95 (d) |
| Arm Assembly Language Manual | | | | | £12.95 (e) |
| Mastering View, Viewsheet and Viewstore | | | | | £12.95 (e) |
| Understanding Interword | | | | | £6.50 (e) |
| View A Dabhand Guide | | | | | £12.95 (e) |
| Z88 Computing | | | | | £9.95 (e) |

## Fanfold Paper and Labels

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|---|---|
| 2000 x 1 Part 60gm 11 x 9.5" Micro Perf. | £12.00 (c) |
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| 1000 x 1 Part 90gm "Perfect" A4 Micro Perf | £12.00 (b) |
| 1000 89mm x 36mm Labels | £4.00 (d) |
| 1000 89mm x 49mm Labels | £6.00 (d) |
| 1000 102mm x 36mm Labels | £5.00 (d) |

Please state Single or Twin Row, when ordering Labels

# CEEFAX Guide

B B+ M

*Software is currently transmitted for a period of one week. Files are available from Friday afternoons to the following Thursday evening, with the exception of the Issues teachers' notes which, due to their topical nature, are available from the Wednesday morning to the following Tuesday evening during the week of transmission. The details are provisional only.*

## Feb 3 to 9

**Alginon** **Alg-ug** **Ex1**
**Ex2** **Ex3** **Ex4**

A set of useful routines to incorporate in your own Basic programs, all concerned with producing graphical representations of data. Highly structured and easy to follow, they may be tailored to your own specification.

**Bisness**

A lively and addictive simulation of the world of the small business. Take the reins of your very own company – in debt to the bank with an ultimatum to pay, wheel and deal, hire or fire as you battle for survival.

**VidiEditor**

The ultimate Mode 7 teletext screen design system. This is the software used by Ceefax to create its entire magazine and has recently been updated to incorporate many new features. Communications protocols are also offered for those with Acorn Prestel adapters and access to the Prestel computer on an information provider level.

**T/Pen03** **SPinter**

A further chance to expand your knowledge of light pens on the BBC Micro. This week's package explores the problems of using a light pen with a second processor. Examples of this, plus how to achieve scrolling using interrupts, are included.

**Teachers' notes**

Notes to accompany the schools broadcasts *Scene*, *Tutor Group Starter* and *Taking Sides*.

**Escape**

Can you collect all the blueprints and avoid the monsters? Play this great arcade adventure from the November 1988 issue of *The Micro User*.

## Feb 10 to Feb 16

**Data** **Words** **Leader**

Produce word search puzzles automatically. Just give the micro your selection of words to be included, and wait as the completed puzzle is produced.

**Emads** **Docu** **Demo1**
**Demo2** **Demo3** **Demo4**

If you've ever attempted creating sound envelopes on the BBC Micro, you will appreciate just how difficult it can be. This program is designed to make the task easier by providing a menu of options for updating and listening to different envelopes as you adjust their individual parameters.

**/Pen04** **Graphic**

One of the most useful features of a light pen is surely graphical input. This week's module examines the method for doing this and provides a program to read the graphics coordinates to allow drawing.

**Notes for schools**

Notes for the current schools programmes *Scene* and *Modern plays: The Crucible*.

**Sta/Src**

Get useful information about your Basic programs memory usage with this useful utility from the November 1988 issue of *The Micro User*.

## Feb 17 to Feb 23

**Catdisc** **CDInfo**

Obtaining details on the contents of any disc is a useful facility for a wide range of programs. CatDisc can be appended to your own Basic programs and returns in a string array, the name of every file held on the disc in the specified drive. Suitable for both DFS and ADFS.

**Text** **Printer** **Code**
**Init** **Proc**

This package goes a long way in solving some of the memory problems associated with assembling very large machine code programs. Using a clever technique of data entry, source code held on disc can be assembled into machine code in ram, and since there is no need for both source and machine code to be in memory at the same time, much larger programs may be assembled.

**T/Pen05** **WStext** **SWgraph**
**Artist**

The last in the series exploring the uses and functioning of light pens. This week it looks at sideways ram light pen drivers and supplies programs to act as drivers for the pen to allow easy modification of your own programs.

**Clock**

Confused by Rubik's Clock? Learn how to solve it in under a minute using this program from the November 1988 issue of *The Micro User*.

**Teachers' notes**

Notes to accompany the schools broadcast *Scene*.

## Feb 24 to Mar 2

**Wordbox** **Intro** **Sample**
**WBdata**

Can you work out the hidden message in the wordbox before your opponent does? Buy vowels or hazard guesses, but don't be wrong because it's at your own expense. Creation of your own words is possible with WBdata, so you can have an inexhaustible quantity of data for playing the game.

**Image** **Dat/inf**

This extremely useful facility adds another three commands to your operating system. It solves the problem of recalling the latest version of a file by date stamping it when saved, so each version then contains its own unique identity. Since the package uses the internal clock, it will only run on a Master series machine.

**T/Ttx00** **Scroll** **Subtitl**

The first in a new series of modules to investigate the Acorn teletext adaptor. It begins by looking at ways of extending the facilities provided by the ATS. Enlargement and scrolling of teletext pages, or obtaining subtitles are looked at this week.

**Teachers' notes**

Notes to accompany the schools broadcast *Scene*.

**Scroll**

A short display routine that draws big Mode 7 graphics and scrolls them across the screen following a mathematical path. Taken from the January 1989 issue of *The Micro User*.

# Learning has never been such fun!

# fun school 2

DATABASE
EDUCATIONAL
SOFTWARE

**A computer is an ideal teaching tool for young children – if you have the right software.**

**Fun School 2 is available for three age groups: Under-6s, 6-8 years and Over-8s. Each pack consists of eight colourful and exciting programs carefully designed by a team of educationalists.**

**The computer itself monitors the child's progress. The skill level – initially set by parents – is automatically adjusted to suit the child's ability.**

**Now children can enjoy using their parents' computer while they learn at their own pace.**

***You can give your children an unfair advantage with Fun School 2 – it's the ideal way to introduce youngsters to the joys of using computers.***

Detailed instructions are supplied with each pack giving educational help to parents and teachers, together with full instructions for each program.

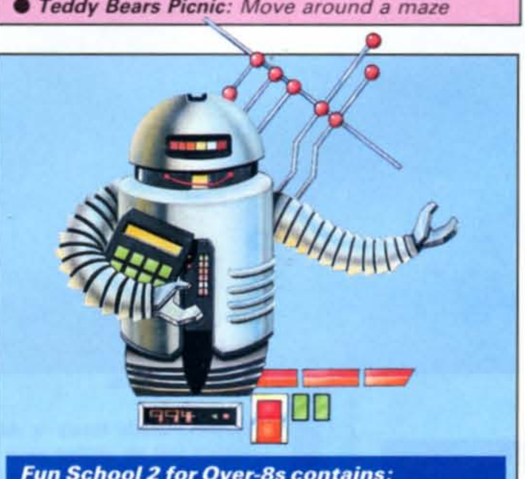
**A colourful button badge with each package!**

### *Fun School 2 for Under-6s contains:*

- ***Shape Snap:*** *Colourful shape recognition*
- ***Find the Mole:*** *Experiment with number sizes*
- ***Teddy Count:*** *Ideal introduction to numbers*
- ***Write a Letter:*** *Creative fun at the keyboard*
- ***Colour Train:*** *Play at spotting colours*
- ***Pick a Letter:*** *Word building made easy*
- ***Spell a Word:*** *Enjoy naming the pictures*
- ***Teddy Bears Picnic:*** *Move around a maze*

### *Fun School 2 for 6 to 8 year olds contains:*

- ***Number train:*** *Calculations made enjoyable*
- ***Shopping:*** *Which shops for which products?*
- ***Maths Maze:*** *Fun improving arithmetical skills*
- ***Treasure Hunt:*** *Introduction to coordinates*
- ***Bounce:*** *Get to grips with angles*
- ***Packing:*** *Discover tesselating shapes*
- ***Caterpillar:*** *Word building challenge*
- ***Number jump:*** *Have fun practising tables*



### *Fun School 2 for Over-8s contains:*

- ***Build a Bridge:*** *Shape-fitting challenge*
- ***Passage of Guardians:*** *Enjoy anagrams*
- ***Unicorn:*** *First steps in problem solving*
- ***Logic Doors:*** *Mapping made easy*
- ***Souvenirs:*** *An introduction to travel*
- ***Code Boxes:*** *Discover binary arithmetic*
- ***Mystery machine:*** *Have fun breaking codes*
- ***Escape:*** *A final check on progress*

## ORDER FORM

Please send me the following for the BBC Micro or Master (please tick)

| | £9.95<br>Tape | £12.95<br>40 Track 5.25" disc | £12.95<br>80 Track 5.25" disc |
|---|---|---|---|
| Under 6s | *2239* ☐ | *2240* ☐ | *2241* ☐ |
| 6 to 8 | *2242* ☐ | *2243* ☐ | *2244* ☐ |
| Over 8s | *2245* ☐ | *2249* ☐ | *2250* ☐ |

*Add £2 per program Eire/Europe; £4 Overseas*

Total enclosed £ ______

☐ Cheque payable to Database Software

☐ Please debit my Access/Visa card no:

Expiry date: /

Name ______

Address ______

______ Postcode ______

Signature ______

***SEND TO:*** **Database Educational Software, FREEPOST, Europa House, Adlington Park, Adlington, Macclesfield SK10 4NP.**

R288

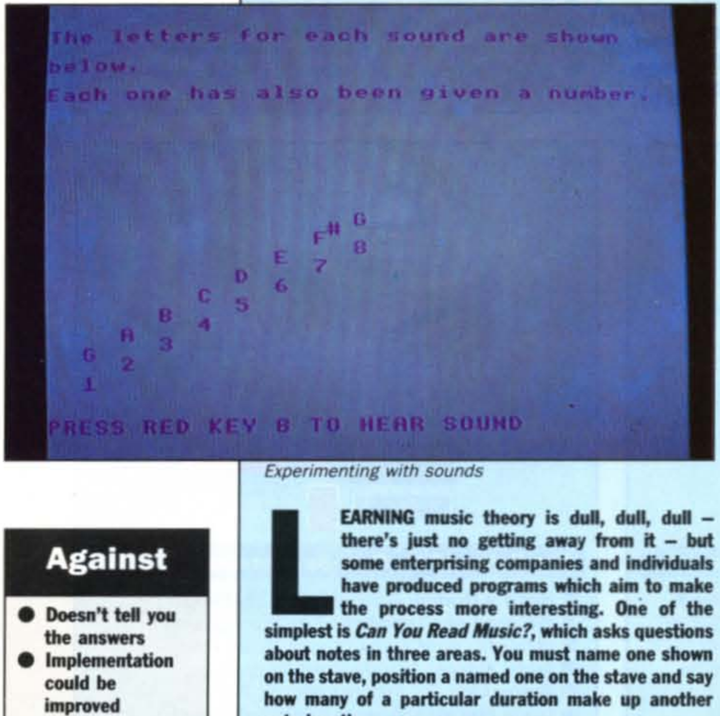
# Mastering music

## *Ian Waugh takes a look at software that tries to make music theory more interesting*

*Product: Theory of Music*
*Price: 80 track or 40 track doubled sided £12.80, 2 x 40 track £13.80*
*Product: Play What I Play*
*Price: 80 or 40 track £8.90*
*Product: Can You Read Music?*
*Price: £7.90 (Can You Read Music? and Play What I Play on one disc, £12.80)*
*3.5" disc £1 extra.*
*Supplier: Ted Kirk, 33 Humber Crescent, Sutton Leach, St. Helens, Merseyside WA9 4HD.*
*Tel: 0744 818761*

### Points for

- **Excellent value for money**
- **Lots of options**
- **Easy to use**



```
The letters for each sound are shown
below.
Each one has also been given a number.

                              F# G
                           E     8
                        D     7
                     C     6
                  B     5
               A     4
            G     3
               2
            1

PRESS RED KEY 8 TO HEAR SOUND
```

*Experimenting with sounds*

### Against

- **Doesn't tell you the answers**
- **Implementation could be improved**

### The bottom line...

**Definitely worth considering if you want a program to help you learn music**

**LEARNING music theory is dull, dull, dull – there's just no getting away from it – but some enterprising companies and individuals have produced programs which aim to make the process more interesting. One of the simplest is *Can You Read Music?*, which asks questions about notes in three areas. You must name one shown on the stave, position a named one on the stave and say how many of a particular duration make up another note length.**

You use the cursor keys to select an answer from a multiple-choice selection but, oddly, you must press the spacebar to register your choice – why not Return? You are given more than one crack at each answer or you can pass – but both these options lose you marks and after 20 questions your score appears.

It's a simple program which lets you choose the level, quite fun and suitable for reinforcing note names, positions and durations.

**Play What I Play** is aimed at secondary and upper junior school students. It tests relative pitch, melodic memory and the ability to relate notes heard to the notes displayed on screen – a sort of sophisticated Simon program. The notes can be shown on a piano keyboard or a diatonic glockenspiel which shows only the notes in the related key. Like Can You Read Music this, too, has several options and uses a similar method of scoring.

The author calls it a game but some of the questions will have you scratching your head – or pulling your ears. It could certainly help you improve your aural ability.

**The Theory of Music** is specifically for students studying for the Associated Board's exams from Grades 2 to 5. It is written in a similar style to the other programs with many options at all levels. It is menu driven but sometimes the colour of the highlight bar almost obscures the menu option – cyan on yellow for example.

You are not given the correct answer at any time although hints sometimes appear. After entering an answer you press r – instead of the spacebar – and then you must press x for the next question.

Seven topics are covered including key signatures, scales, intervals, bar lines, time signatures, rests, musical terms and the arrangement of chords on two staves. All sections tie up with parts of the Associated Board's Rudiments and Theory of Music. A set of Teacher's Notes is included and this contains further information on the program but isn't essential reading.

The program doesn't include every type of question you'll come across in the exam – the manual details the omissions – but if you score well you'll have an excellent chance of doing well in the examination room.

*Product: Reading Music*
*Price: 4 x 40 track discs £25 or £7 per disc*
*Product: Musical Dictation*
*Price: 3 x 80 track discs £19 or £7 per disc*
*Supplier: Musicality Software, 15 Cheddington Road, Edmonton, London N18 1LT.*
*Tel: 01-803 9449*

MUSICALITY Software has two sets of rather massive programs. Reading Music contains a total of 18 routines and Musical Dictation contains 24.

**Reading Music** teaches music theory from the most basic aspects such as rhythm and pitch right up to key signatures, tonic triads, musical terms and signs. It doesn't carry any grade markings, although the poorly-photocopied instruction sheets list the contents. The course is divided into parts, programs, sections and chapters, but this tends to confuse rather than help you find your way around it.

After completing a section you are sent back to the chapter menu rather than the part menu which would seem to be the more logical option. This prompts for a program number when it really means a section number. Some programs are not even in chronological order, for example, program eight contains questions about programs nine and ten. Programs seven and eight are reversed on this menu option, too. It's really not as confusing at it may sound, but it really needs to be sorted out.

In the early exercises, when learning note names, the software insists on playing the notes. This is unnecessary from a practical point of view and as most sequences are fairly bland, also rather unmusical.

Notes are positioned using the U and D keys for up and down and confirmed by pressing the spacebar – why not use the cursor keys and Return? If you answer incorrectly you may be given a hint or referred to the relevant program and section number for revision – nice.

Input isn't standardised. Note names, for example, only require a single keypress, some numeric input must be followed by Return and some text entries are checked letter by letter so there's no opportunity for correcting a mistyped answer.

The answers to some questions requiring text input are shown in jumbled – anagram – form which is pretty inane. Can you work out what *Fine* means if you're given *het nde*? Some questions contain beamed notes on a stave but where the beams run over the stave lines they are difficult to see.

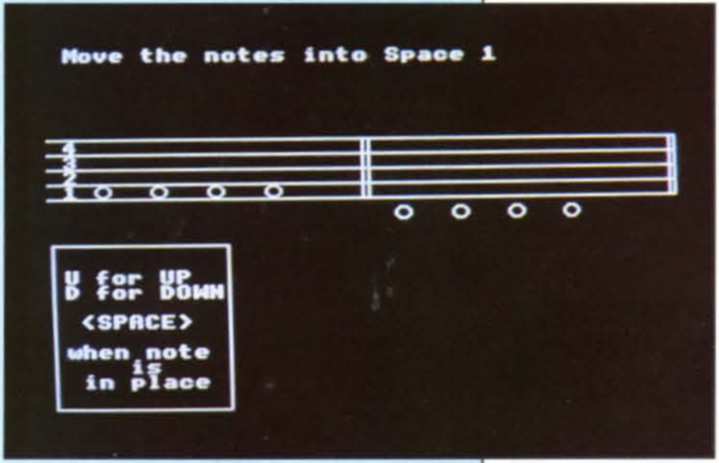
You can't escape from a program once you're in it and you can't skip questions. You are not scored during the exercises, only on the two tests in part 7 – programs 17 and 18. The exercises and tests ask the same questions each time through – surely unforgivable on a micro with a RND function.

**Musical Dictation** is a set of aural training programs. It starts off with simple high/low exercises then long and short note durations are introduced along with variations in pitch and rhythm. In many exercises you must enter a sequence of note durations which are played by the micro. Once a duration has been entered you can't erase it, and if your answer is wrong everything is wiped out and you are prompted to try again.

Some exercises play a sequence of notes twice, but you can't repeat it if you're still a little unsure. In fact, you can't quit some exercises; neither do they show you the correct answer – you just have to plug away till you get it right.

The more advanced tests are similar but in different keys which would make little difference to anyone unless they had perfect pitch – in which case they'd sail through an aural exam – but you aren't given a reference note to start with, which makes some questions particularly difficult.

I'm afraid I couldn't really get excited about these programs. Although they cover a lot of ground and the content is reasonably thorough, the implementation is poor. They miss many opportunities afforded by the micro to add interest and variety to what is, after all, one of the less-exciting aspects of music.



```
Move the notes into Space 1

U for UP
D for DOWN
 <SPACE>
when note
    is
 in place
```

*Learning about note positioning*

### Points for

- Fairly thorough content

### Against

- Implementation needs to be improved
- Cost seems a little expensive

### The bottom line...

Good try but could do better

# The clothes show

## Marshall Anderson learns how to put on the style

*Product: Fashion – the T-Shaped Garment*
*Price: £20.00*
*Supplier: Coventry CBL, Casselden House, Greyfriars Lane, Coventry CV1 2GY.*
*Tel: 0203 831756*

**THIS package from the Coventry CBL unit is aimed at the secondary/college market. It takes a student through the various processes involved in making a T-shaped garment, the sort of task a fourth or fifth year GCSE candidate might undertake.**

The menu presented divides this task into three units, Design, measurement and construction. If followed consecutively these will take you through the process introducing new ideas and skills as you go along. The design section introduces the T-shaped garment, one of the simplest shapes you might want to make – looked at from a creative standpoint.

You explore different neck lines and see the effect of shortening or lengthening sleeves, along with some explanation of the way they are shaped and made. There is also the opportunity

**Turn to Page 76 ▶**

### Points for

- Good use of graphics
- Step by step approach

◀ From Page 75

to look at the additional design ideas of using pockets, applique, inserts, trimming and slits.

There follows a step-by-step look at exactly how measurements are taken for clothing. This section divides into male and female to demonstrate the different measurements that have to be taken. Once this is complete the measurements are transferred to a pattern and instructions given on how allowances are added at this stage for seams, hems and so on. To complete the pattern another tutorial section takes you through the method used for shaping the neck and its facings.

After the pattern has been created and labelled the fabric must be chosen. This section considers and demonstrates nap, pile, and pattern and the way they will affect layout and construction. This section also gives the opportunity to look at the way colours work together.

Having bought the wherewithal to complete this garment the program moves on to help with its construction. You find out all about something called *straight of grain* and how this is going to affect our layout on the cloth. Armed with this information, along with that on nap, pattern and pile, the micro invites you to wield the scissors.

Now that you have in front of you a pile of material in assorted shapes and sizes, assuming you can remember which is pattern and which waste, the program coaxes you further into the terrors of actually fitting the whole thing together into some sort of recognisable form by constructing plain seams, neatening and tapering them. Then neck facings are attached along with any little extras like pockets, inserts or, presumably, designer labels.

This package is designed for the complete beginner and in that respect at least it seems to be fairly well on target. Some of it seems a little shaky, technical terms are often explained but sometimes not. There are several lines of text on what exactly a hem is but the term *ease* is blithely dropped in with no further reference. Input handling is poor – there are few second chances.

Almost all the manual skills are illustrated, usually quite well, and when the program examines anything to do with the creative side of things it does a good job. The section on choosing fabric and joining patterns is very good indeed as several right and wrong examples are shown on the screen.

The problem here is not so much the quality of the package, for something so extensive it is good of its type, but its effectiveness in the classroom. With the exception of the design and creative side of the package, the rest can be done much better by other means – through books, work sheets and personal contact.

The package demands that students have ready access to the micro at many stages of the designing and making process and this will cause resourcing problems for many schools and colleges. That is not to say that it won't find its way into many design departments and be exploited very well but the teaching part of the program seems of limited use, despite the wealth of worksheets provided with it.

In general, micros are not capable of being good teachers – they don't have the capacity to respond to the many needs of the individual unless the thing to be learned is small and tightly defined. This package, for instance, does not respond usefully if you tell it that your chest measures 2500 cm. Perhaps that part of things is best left to the tutor while the micro concentrates on what it is good at, allowing students to try designs out on the screen first, to play with pattern and colour in a creative way. When this package deals with these things it is at its best, and it's a shame those parts were not more extensive.

### Against

- **Very difficult to resource**
- **Tutorials ineffective**

### The bottom line...

**Useful on the creative side but do the teaching yourself**

# Myths and legends

## *Hindu tales revealed to desktop publisher Phil Tayler*

*Product: Ramayana Tales*
*Price: £15.95*
*Supplier: BBC Soft, PO Box 234, London SE1 3TH.*
*Tel: 01-576 2548*

**THE cover describes this package as *A program for Young Publishers,* and goes on to suggest a suitable age range of seven to nine. Yet this is not the type of DTP package so popular in schools today, but it would be eagerly received by children throughout the junior age range. One reason for the age range is explained by the fact that this software has been designed to support the Watch BBC television series. This includes a module on festivals on a truly multi-cultural basis.**

The Ramayana is an ancient Indian poem sacred to Hindus, and a reasonable knowledge of this piece is essential. There's a wealth of characters and wisely the software only concentrates on a few of the main ones in the epic. Even if you are totally unfamiliar with Asian mythology you will find plenty of ideas and information.

The publishing side is easy to use and very well thought out. There are 68 pictures through which you can browse. Some are complete featuring the heroes such as Sita and Rama, whereas others are of a single tree. All pictures are detailed and the Mode 2 colours are used very well. After browsing you can then use them – or the printouts supplied – to build your own story using the Edit option.

This is simplicity itself, as any picture can be brought on to screen and moved around the invisible 20x14 character grid. Should you change your mind, any shape can be highlighted, moved or deleted. The picture colours are fixed, but the captions are left to you to place and write

Turn to Page 79 ▶

### Points for

- **Colourful and lavish images**
- **Extremely straightforward to use**

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# The land of Shades

*by someone who has been there and survived*

*I TOLD you last month how to kill and run away when others come after you with the axe, the rusty longsword or even the mild unassuming rat which hath teeth the like of which I have never seen.*

*The best way to practice if you are a worthless beginner is by bashing the mobiles like the deer. But sooner or later another player will attack you, and if he is any good he may do rather more than just type K BABY LS and wait to see what happens.*

*So learn your spells. You cannot use all of these at once but when you have acquired enough points new spells become available. But you must know what some of them are in case big tough bullies like Spitzen use them against you!*

*Most useful is STEAL which you can use to deprive your opponent of his only weapon.*

*Then there's STRIP and FUMBLE. The first makes you drop any weapons you are carrying, and the second makes you drop everything. Useful in fights where your opponent has more than one weapon.*

*When it comes to the best weapons like the rusty longsword or the rat, you can only carry one at a time unless you steal another. So if a player has both, and you make him drop them, he can only pick up one, leaving the other for you.*

*You need to know how well you are doing in a fight, in order to flee in time. Spitzen's remaining stamina can be revealed with QS SPI, and as you will see your own going down, you can tell who is winning. Spitzen of course, so run away and hide!*

*To find out what weapons Spitzen has use I SPI. But remember players may be carrying invisibly, so you may have to guess or wait until attacked.*

*A very nasty spell is CRIPPLE which only lets you move one step at a time by typing HOBBLE. Fighters who use this are the scum of Shades but there is no law against being scum, so be careful.*

*If you are not much good at fighting your best bet is to QUIT straightaway and log back on to whinge and moan and let everybody know what you think.*

*Above all, if you want to learn how to fight, do not use your favourite character, create a special one to practise with. Later you can take out your 'main' character reasonably confident of handling the killers.*

*Next month I will talk about the safe places in Shades like the pub, the church and the bridal suite, and what you can do in them (Oooo-errr.!)*

*May the goddess be with you!*

*Whirlwind*

*PS Congratulations to Stunner the really gorgeous Witch, the first TG player to reach immortality! Also to Stingray who made it in record time – at the second attempt He He!*

*And hi to the MicroLink gang – Arfabrain, Skeeve, Zimmerman, Mnementh and Zakym. And a special hello to Dodo from Iceland!*

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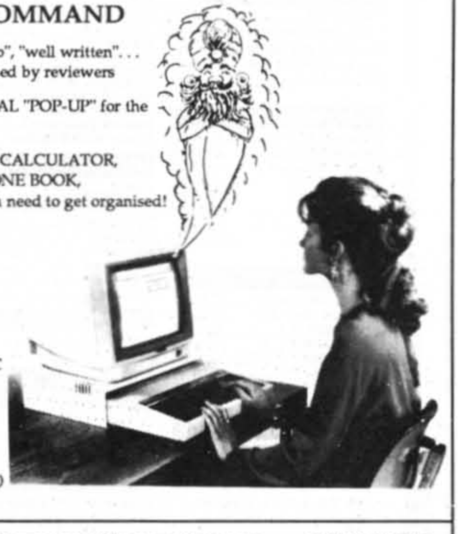

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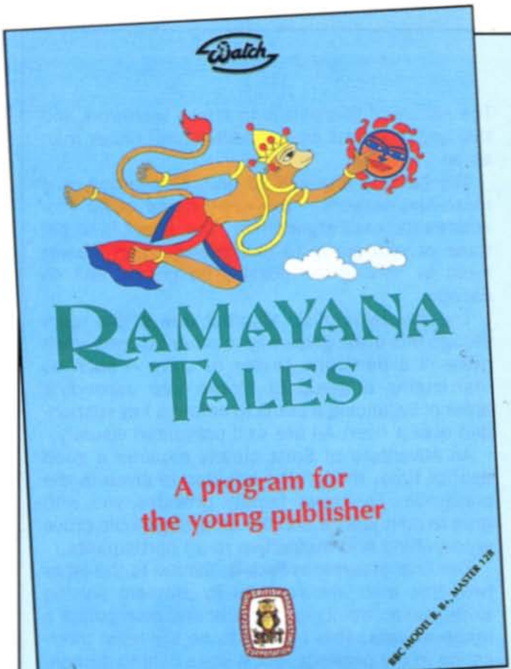
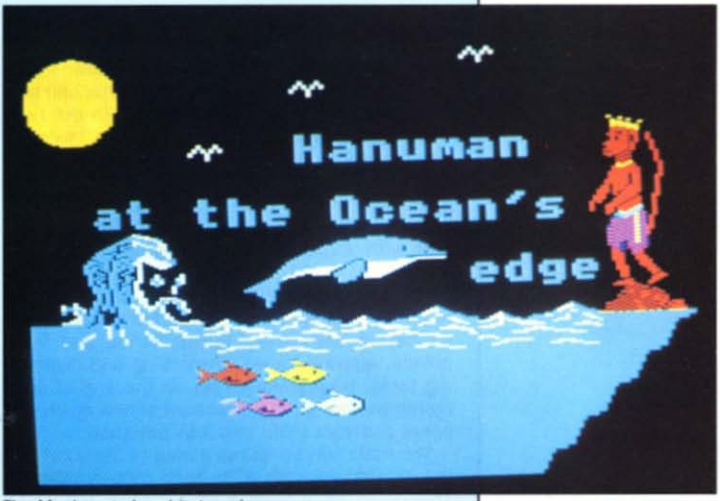

Watch
RAMAYANA TALES
A program for the young publisher
BBC MODEL B, B+, MASTER 128

◀ From Page 76

from a combination of seven solid and two flashing colours. If you are feeling adventurous you could try some simple animation.

A third option lets you display your version of the Ramayana or any other story using the central characters of Ravana, Sita, Jatayu and Rama. This is done by using the strange key combination of < and >. You can also expand on the stories by pressing J which allows you to jump to any other page. In this way the 40 available pages could well be greatly expanded.

Hidden is a fourth option for teachers where you can set parameters such as the maximum number of pictures on any one page. You can also decide if you want the class to have the option of clearing a page. If you choose to allow this the program automatically saves an emergency version – a very nice touch.



The Monkey god on his travels

How rigorous is the program in use? Sadly the Break key is not disabled – possibly fatal for an interactive package. However you are advised not to work from the original discs but from back-ups.

All in all Ramayana Tales is well error-trapped and encourages experimentation and imagination. One use we found was to create magazines by printing out the screens. Unfortunately, though, the dump utility supplied produces only a positive or negative image. The lavish colours are lost and a nice addition would have been a colour print routine.

At the moment only those schools with a colour dump resident rom will be able to make the very best of this program's potential. For schools using the Watch programmes on Festivals, and in schools with children of Hindu origin, I believe it offers a unique and very adaptable package.

**Against**

- **Rather limited in application**

**The bottom line...**

**Very good as far as it goes**

# On the buses

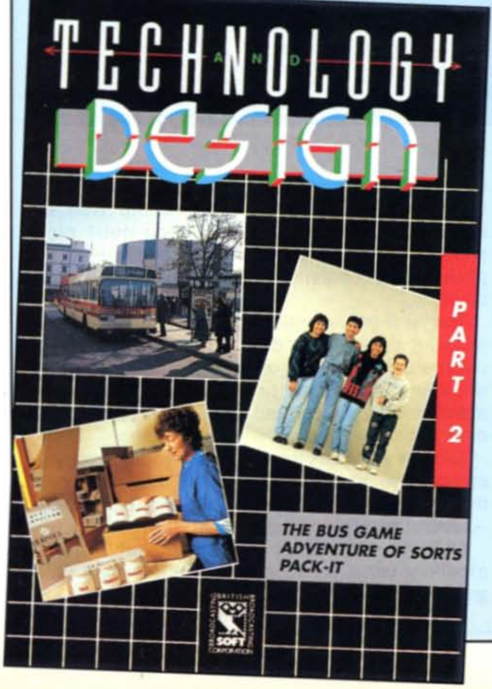
## An adventure in packing examined by Tony Flanagan

*Product: Technology and Design (Part 2)*
*Price: £24.95*
*Supplier: BBC Soft, PO Box 234, London SE1 3TH.*
*Tel: 01-576 2548*

**THIS package contains three very different programs designed to test and develop a variety of skills from the simple keying in of data to quite advanced problem solving. The package would suit the upper school range, especially GCSE students taking design and technology courses, though each program could be used as stimulus material in other subjects too – including those more advanced and vocational in nature, such as retail and management.**

In the first of the programs, **The Bus Game**, you

Turn to Page 80 ▶



**Points for**

- **Plenty of material**
- **Well-packaged and presented**
- **Well-written and easy to follow manuals for each program**

◀ *From Page 79*

take on the role of manager of a town's bus system. Up to four individuals or groups can play in each of the three game options. In the first, each company starts with £100,000 with no established routes. In the second, one company starts with a developed network of routes and £50,000, while the rest start as in the first option. The third option gives one £500,000, the rest with £100,000 and all must build their routes.

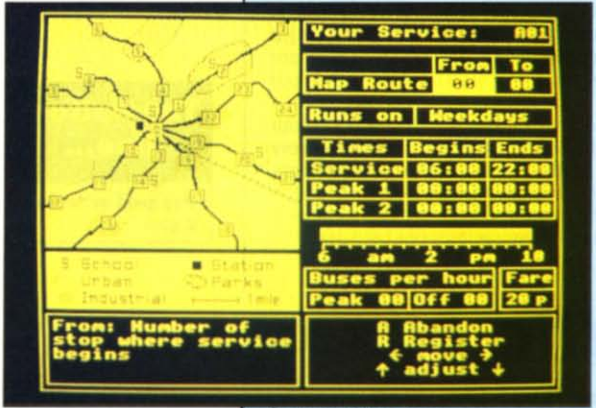
Companies must take it in turn to make a variety of decisions. You are given full responsibility for buying and selling buses, hiring and firing drivers, altering routes, increasing and decreasing fares, wages and so on. At the end of each month you are given an account of how much was spent and your profit and loss situation.

The main screen shows a map of the town and the available routes with each stop numbered. This could have been a little clearer but works relatively well once you have got used to it. The gameplay, which is menu driven, is quick and logical, though I would advise teachers to familiarise themselves fully with the manual.

Success depends on exercising a range of decision making skills whether finanacial, managerial or social. There is a good deal of data to interpret in numeric and graphic forms. The essential point is that decision making is cyclical rather than linear, and that taking several factors into account simultaneously is very important.

## Against

- **Time consuming**



Your Service: A01
From To
Map Route 00 00
Runs on Weekdays
Times Begins Ends
Service 06:00 22:00
Peak 1 00:00 00:00
Peak 2 00:00 00:00
Buses per hour Fare
Peak 00 Off 00 20 p
From: Number of stop where service begins

*Controlling your fleet*

**Adventure of Sorts**, the next offering, combines the problem solving of an adventure game with the gathering and interpretation of a range of data. Initially you must gather a range of physical statistics relating to the members of a group of up to 40. Such numerical data is mostly conventional – height, weight and so on. But some is bizarre – ring finger size and foot length. All is important, though.

Once all the information for the 13 fields has been gathered it is keyed into a data sorter. As you would expect, this sorts the data according to a variety of criteria. At this point a team of six students must be selected to provide a good variety of physical differences. A wide range will be needed to solve the physical and technological problems. A default is supplied with the program. The nature of this part is to stress teamwork and tackling problems as a collective unit rather than as an individual.

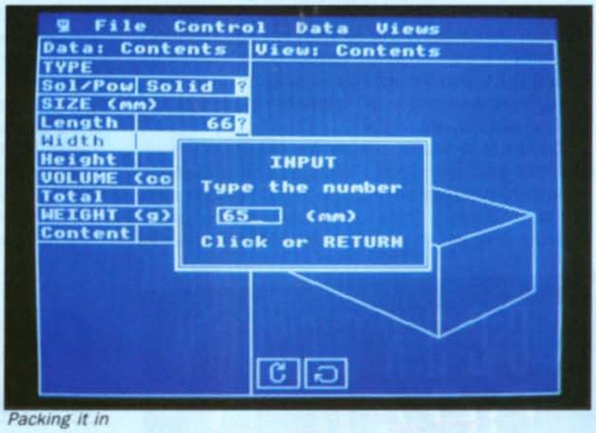
The game is a typical adventure centering on a maze-like network – the weird home of Mr Procrustes the mad ergonomist. The object is to get three of your group to this strange man's tower room by solving the puzzles he poses, and so escape.

The display is of an abstract view of the room though this often gives way to other screens when there is a particular teaser to solve – such as rearranging a group of blocks into ascending order or balancing a plank to obtain a key suspended over a river. All are well-presented visually.

An Adventure of Sorts clearly requires a good deal of time, though the solution is given in the playguide. The save facility provides you with time to do it justice and the program should prove entertaining and instructive to all participants.

The final program is **Pack-It**. Similar to the other two, this also involves you in problem solving skills and an ability to interpret and manipulate a range of data. This I found to be the least interesting in the package, but it does help to demonstrate how important design is to packaging products economically and with the minimum of wastage.

The program enables you to design your own cartons and pack them in cases and then on pallets. Initially, you need to decide what type of materials you want to package, whether powder or solid – as this will influence the type of cardboard box you decide on. You must also choose the size of case and pallet and attempt to pack all the contents as economically as possible.



Data: Contents
View: Contents
TYPE
Sol/Pow Solid
SIZE (mm)
Length 66
Width
Height
VOLUME (cc
Total
WEIGHT (g)
Content

INPUT
Type the number
65 (mm)
Click or RETURN

*Packing it in*

The screen is split into two halves – one showing the various data, the other the three dimensional drawings of whatever is specified – whether carton, case or pallet. Any wastage is automatically calculated and displayed in the data panel.

Though well presented, the program lacks the competitive element present in the other two though teachers could introduce this themselves – careful reading of the manual is necessary.

All in all, Technology and Design Part 2 offers excellent value for money with three good programs in the same package.

## The bottom line...

**For teachers who are following a specific syllabus, this might be too time consuming**

# The book of the software

## *A good read? Jon Revis looks at a guide to Mini Office II*

*Product: Mini Office II – A Dabhand Guide*
*Price: £9.95*
*Supplier: Dabs Press, 5 Victoria Lane, Whitefield, Manchester M25 6AL*
*Tel: 061-766 8423*

A Dabhand Guide
BRUCE SMITH
ROBIN BURTON
Mini Office II
BBC B/B+/Master Series version
DABS PRESS

**MINI Office II, the award winning suite of business programs, has been available for several years, so why bother to release a third party user guide for it now? For many BBC Micro owners – including many who are not *au fait* with the finer points of the jargon – it is still the first serious package they buy and it is at these users that the book is aimed.**

The 256 pages go to great lengths to try to explain all features of each and every Mini Office II module – a task that is already performed very competently by the manual supplied with the software. The book's greatest strength, however, is the well organised approach to the task in hand – this I cannot fault.

Some time is spent at the start discussing file management. An explanation of directories and sub-directories is followed by advice on choosing meaningful filenames. Finally file management is tackled at office level and you are recommended to keep documents, databases, and spreadsheets on separate, well labelled discs, with up to date backups being a main priority. All of this is sound practice that most of us are already aware of but seldom follow.

Word processing is the first utility to be given the Dabhand treatment. Beginning with the first few tentative sentences typed into the editor, you are coaxed through block manipulation, loading, saving and, finally, the potentially confusing subject of mail merging. When explaining the importance and use of embedded commands to control the layout of the printed output the authors wander off into the realms of Basic programming. Only after six pages did they get around to using the CC command and embed the required codes in the text.

A demonstration disc to enhance the book is available and included on it are several word processing files. These include a short passage for use in block manipulation experiments and a standard letter and database for use with the mail merging facility.

Chapter 14 is packed with some juicy tips on function key definitions. Instead of plodding through several levels of menus to get from the editor screen to the file save menu you can store all of the necessary key presses in a single function key – this is mentioned in the Mini Office II manual but not demonstrated. The Dabhand guide provides a complete list of useful key definitions plus instructions on how to *EXEC them from a file at a future date.

The database section is opened using the same approach as the previous one – the importance of planning when constructing a database is emphasised. When considering template design everyone remembers to include fields for things like name and address, but what about a couple of extra single character ones to indicate whether or not a club member is on the committee or has paid this year's subscriptions? It is only when you are experienced in database design that you build in these essential yet not immediately obvious fields, and the book tries to pass on that experience quickly.

In the original Mini Office II manual the operation of the database utility is explained in nine pages. The Dabhand guide has expanded upon this somewhat with chapters weighing in at a hefty 46 pages.

While the Mini Office II word processor appears to have changed little over the years the same cannot be said about the database – versions for the B+ and Master have much improved search facilities, all of which are explored fully in the guide. The closing pages of the database section discuss memory usage and how this can be maximised through efficient database design and

**Turn to Page 82 ▶**

◄ From Page 81

a few tricks with the BBC Micro itself.

Assuming the role of carpet fitters, you are launched into spreadsheets and it came as no surprise that careful planning was also the foundation of good spreadsheet design. Not only must you decide how to cram it into the BBC Micro's meagre memory, but you must also construct it so that the finished output will fit on your printer.

As an example you're led through the planning of the carpet laying spreadsheet. Every step is discussed in detail, from breaking down the manual job into its constituent tasks, using the word processor to create and print a dummy sheet, right up to spreadsheet creation and data entry. The ever-useful demonstration disc even contains a neat routine that will print a wide spreadsheet sideways with a dot-matrix printer.

Once you have entered and calculated all of this wonderful data what else can you do with it? You can use the graphics program to convert it in to a pictorial form, and this is covered in Chapter 29 where the advantages and limitations of the graphical representation of data are first discussed. Heavy stuff. Eventually the conclusion is that graphics are all right really and the technicalities of drawing pretty pictures are then explained.

Mini Office II Communications software is treated to a relatively brief, but nonetheless informative, Dabhand approach. Background information about computer communications is followed by use of the Mini Office II software and finally an annotated printout of a MicroLink session.

Unfortunately the book does contain several omissions and factual errors that could prove confusing to an inexperienced reader.

On page 12 you are informed that users of rom and disc based Mini Office II packages can access the individual modules by the use of star commands. I duly inserted the disc and typed the appropriate commands only to be greeted with a *bad command* message – it would appear that not all disc versions can be run in this way.

Moving on to page 13 I spied the possible solution to my dilemma: Appendix A, it claims, contains a list of the differences between the many versions of Mini Office that have evolved through the years. That's wrong – Appendix A actually contains a list of Epson printer codes which looks as if it has been lifted from another book rather than tailored to Mini Office II users.

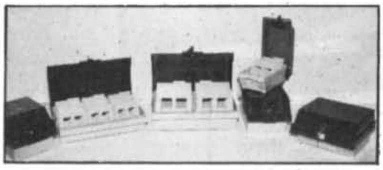
Bruce Smith and Robin Burton have produced a friendly and informative book that goes to great lengths to try and instill the necessary degree of organisation and forward planning into the new user. Unfortunately it is marred by these irritating inaccuracies.

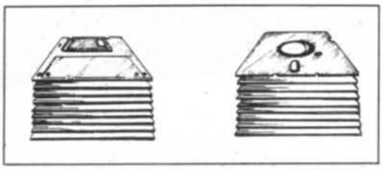
## Points for

- **Chatty yet informative approach**
- **Brimming with useful tips**
- **Accompanying disc of demonstration files**

## Against

- **Several potentially confusing inaccuracies and omissions**





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# Saving grace

## *Make your Forth block handling much faster with Martin Goose's utility*

**FORTH provides standard calls for loading and saving to disc and tape, but if you have additional sideways memory it's very simple to create the words to implement a Forth ram disc. Loading and saving to ram is much faster than similar disc accesses, the only problem being the fact that you lose any data when the machine is switched off. And provided you save it to disc at the end of the session or have battery back-up even this needn't be a problem.**

These listings give you a complete ram disc so you can speed up your Forth operations. Just type in each block – separated by the titling comments – and make sure you save them to disc or tape before switching off.

The core of the ram disc is osword 66 which transfers data to and from sideways ram. This call was first implemented on the B+ and also exists on the Master series. However, several of the better third party ram boards for the BBC B do implement it correctly. Reading and writing blocks of data is accomplished by creating an equivalent of the disc word DR/W and tape word TR/W which are already provided.

To produce this new word several others need to be defined first:

- **OSWORD** This is defined in assembler and takes a parameter block address and call number as stack parameters when it executes.
- **\** An extra word for adding comments to a block – it ignores all the text following on the current line. The existing word **(** also terminates at the end of the line but has to scan all the following symbols in case there is a terminating symbol **)**.
- **OSBYTE** Also defined in assembler, this word takes the X and Y registers and call number as parameters. Because there are so many types of osbyte call – requiring three, two, one or no return values – it is not convenient to place them on the stack as it would lead to much DROPping

***Turn to Page 84 ▶***

```
(Cold Start definitions         1 of 7 )

: \ ( -- ) (ignores text to line end)

      >IN @  64 / 1+ 64*
      >IN ! ; IMMEDIATE

----------------------------------------

(Cold Start definitions         2 of 7 )
HEX
CODE OSBYTE  ( X, Y, call number -- )
  XSAVE  STX,       \ save stack pointer
  2  ,X  LDA, TAY, \ Y to Y register
  0  ,X  LDA, PHA, \ call number
  4  ,X  LDA, TAX, \ X to X register
  PLA,              \ get call number
  FFF4  JSR,        \ do FX call
  CS IF, 1 # LDA, ELSE, 0 # LDA, THEN,
  PAD 2+ STA,       \ carry at PAD 2+
  PAD    STX,       \ X at PAD
  PAD 1+ STY,       \ Y at PAD 1+
  XSAVE  LDX,       \ restore stack
  INX,   INX,
  POPTWO JMP,       \ drop 3 & return
END-CODE  DECIMAL

----------------------------------------

(Cold Start definitions         3 of 7 )
HEX
CODE OSWORD  ( block address,
             (    call number -- )
  2  ,X  LDA, TAY, \ msb to Y register
  0  ,X  LDA, PHA, \ call number
  4  ,X  LDA, TAX, \ lsb to X register
  PLA,              \ get call number
  FFF1  JSR,        \ do osword call
  XSAVE  LDX,       \ restore stack
```

```
  POPTWO JMP,       \ drop two & return
END-CODE DECIMAL

----------------------------------------

(RAMdisc                        1 of 5 )

CREATE PARAMBLK
       0  C,        \ Read/Write flag
       0 , 0 ,      \ buffer address
       1024 ,       \ size of block
       0 C,         \ Ram id fo R/W
       0 ,          \ address for R/W

----------------------------------------

(RAMdisc                        2 of 5 )

: RR/W  (buffer addr, block number
        (R/W flag )
  IF 0 ELSE 128 THEN
  PARAMBLK C!       \ set R/W flag
  64 MOD 16 /MOD    \ reduce to MOD64
  4 + PARAMBLK 7 + C! \ set rom id
  1024 * -32768       \ and
  PARAMBLK 1+ !       \ romm address
  PARAMBLK 66 OSWORD ;

:RAM   ASSIGN R/W TO-DO RR/W ;

:DISC  ASSIGN R/W TO-DO DR/W ;

----------------------------------------

(RAMdisc                        3 of 5 )

EXVEC: SOURCE  EXVEC: DEST

: MOVE-BLOCKS ( first, count -- )
```

```
    OVER + SWAP
    DO
      SOURCE I BLOCK DROP
      UPDATE DEST SAVE-BUFFERS
    LOOP ;

----------------------------------------

(RAMdisc                        4 of 5 )

: DISC>RAM
    ASSIGN SOURCE TO-DO DISC
    ASSIGN DEST   TO-DO RAM
    MOVE-BLOCKS ;
: RAM>DISC
    ASSIGN SOURCE TO-DO RAM
    ASSIGN DEST   TO-DO DISC
    MOVE-BLOCKS ;

----------------------------------------
(RAMdisc                        4 of 5 )

CREATE EMPTY ] ." \ EmptyRAMdisc " [

: ?INIT 12 >VDU
    ." Blank the ram disc (Y/N) ? "
    KEY DUP EMIT 89 =
    IF
      RAM
      CR ."Blanking "
      64 0 DO I 4 .R
           I BUFFER 1024 BLANKS
           EMPTY 2+ COUNT
           I BLOCK SWAP CMOVE
           UPDATE FLUSH
         LOOP
      DISK
    THEN CR ;
?INIT FORGET EMPTY
```

◀ *From Page 83*

of items off the stack.

The method used is to return the values to PAD, which means nothing is on the stack so nothing needs to be DROPped and the calling word can extract the data it needs from PAD.

Getting data from PAD to the stack is quite simple:

| To get | Use |
|---|---|
| X register | PAD C@ |
| Y register | PAD 1+ C@ |
| Carry flag | PAD 2+ C@ |
| XY 16 bit value | PAD @ |

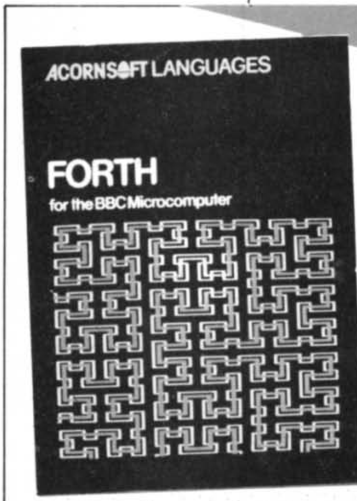
Forth uses the vectored word R/W to move data between its block buffers and mass storage devices. The term vectored is used to show that the word can have a different definition depending on which mass storage device is being used: For disc it is vectored through DR/W and for tape through TR/W.

All that's needed to change its method of operation is to use the phrase:

```
ASSIGN R/W TO-DO DR/W
```

RR/W calculates the sideways ram location for a given block, sets up the data in the parameter block – *PARAMBLK* – and then calls osword 66. Two words have been defined to switch media – *RAM* and *DISK* – and two more copy data blocks between media: *RAM>DISK* and *DISK>RAM*.

If you accidentally crash your system with valuable data blocks in the sideways ram you will find that they will still be intact even after a Control+Break. As with all Forth, the general principle is to omit all error checking in the word definitions – checking can be incorporated during program development and eventually removed to obtain improved execution speed.



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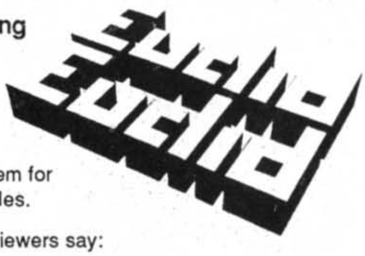

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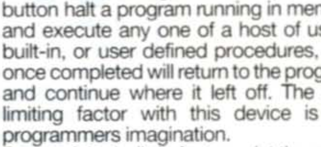

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## COMING SOON...

**Master Speech Cartridge**

# A tour around your Risc OS

### Steve Turnbull continues his look at the new Archimedes operating system

**WE looked last month at plugging in your new Risc OS and how it looks when you switch on. Let's continue by taking an overview of the DeskTop along with some new system concepts which make it easier to use. It is generally agreed that the most user-friendly operating systems use Windows – it was Apple which first researched, developed and marketed Wimp systems in the ill-starred Lisa and later with the more successful Macintosh. Since then many companies have emulated this innovation – and Acorn has improved on it with the Archimedes Wimp Manager.**

Although the original Arthur operating system had a window-based desktop it failed to implement many of the key features expected. Foremost among those missing was the ability to drag file icons from one window representing the contents of a disc to another and have the actual file copied over.

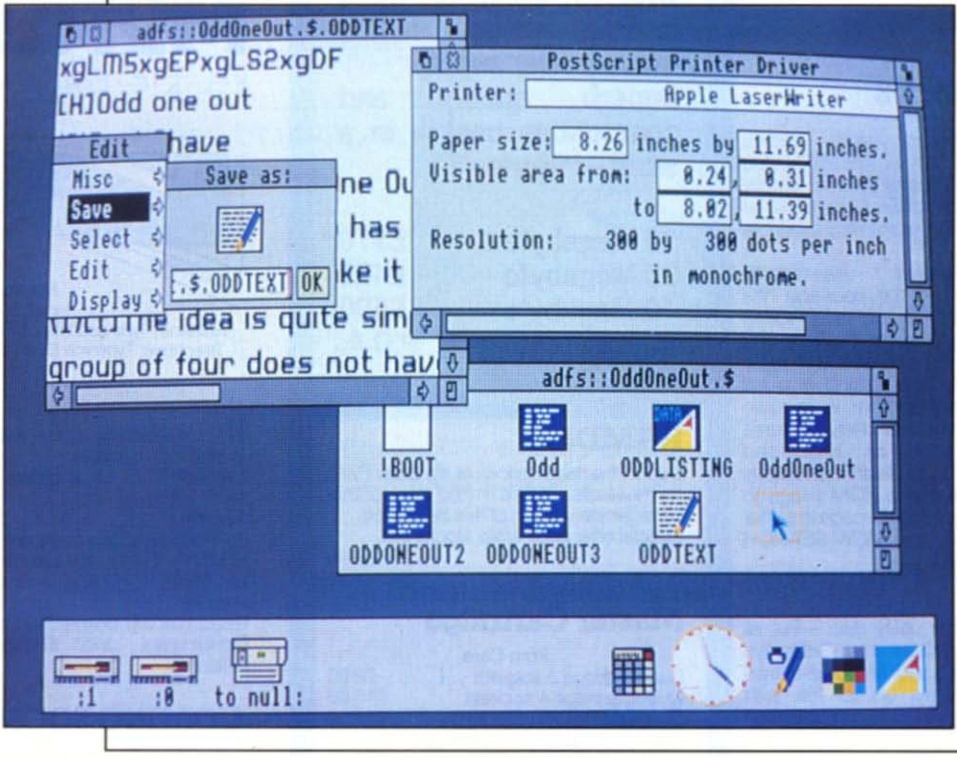
In addition, a favourite Macintosh facility was the ability to click a document icon, say a text file, and have the operating system find the correct application program – word processor in this case – on the disc, run that with the originally clicked document loaded.

Finally there is the ability to recognise discs by name, so if a file is supposed to be saved on to a specific one – say called TextFiles – the filing system will check the drives and if the disc isn't present it will request that you insert it. When you finally do the file is saved.

Well, under the new Risc OS the Archimedes will do all these things and more. If you drag a file icon to a directory window the file is copied, but if you do the same with Shift held down the file is moved. Using Adjust, you can select more than one file at a time and move or copy the lot.

As mentioned last month, double-clicking an application program runs it, even if it's actually a directory. But you can open it up to view the contents by double-clicking with Shift held down. By doing this you get access to the various sprite files and can personalise the icons.

Another Macintosh feature implemented on the new operating system is the choice of file representation: Large icons with filename below, small icons next to the filename or *Full info* with small icon, name, access levels, file size, file type and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*Saving a file by dragging the icon*

date of creation. The files themselves can be listed alphabetically, by file type, size or creation date. However this is not a complete system because the directory window format is not stored in the directory itself and resets to large icons when the machine is switched off.

The task icon – the Archimedes symbol at the bottom right of the display – gives access to a wide range of facilities: You can invoke the task display, exit the DeskTop completely, start up new tasks or issue star commands. The last two are virtually identical except that a new task starts in its own Wimp-created window and star commands take the whole screen.

The task display produces a list of all the tasks currently running, together with their memory allocations, and it allows you to dynamically alter such things as screen and RMA size, system ram allocation and extent of ram disc. Creating a ram disc automatically places its icon on the bar and it remains in place until you press Control+Break or reduce its size to zero.

An annoying feature – one of the very few grumbles – is that the screen size resets to the minimum required for the current DeskTop screen mode – usually 80k for Mode 12. You must manually adjust the screen size using the task window every time you run a program that needs more unless it automatically grabs what it needs.

Next in from the task icon is the Palette icon and, as before, this allows you to redefine the current colour set but clicking Menu on it brings up a further set of options: Invert swaps the components of the first eight colours which are shaded from white to black and there's the default option which resets them to their original settings. Save simply allows you to put a palette file of the current settings to a storage medium.

Finally you can change screen mode: The DeskTop will run in any – including custom designed ones – as will any properly written multitasking utility, such as those provided. This amazing trick is performed by the Wimp which automatically chooses colours to approximate the originals. In modes with few colours the Wimp simulates more by pattern shading.

One of the less important, but very impressive, features of the new software is window movement. Under every other Wimp system on any other machine if you want to move a window around the screen you click on the title bar and hold the mouse key down. A rectangle of dotted lines the size of the window appears and you move this. When you release the button the window is moved to the new position and comes to the front of all the other windows on screen. The same principle applies to window scrolling and re-sizing.

## MULTITASKING

The operating system technique which allows more than one program to run at any given moment is called multitasking and the Archimedes demonstrates one of the best methods in this field.

There are two main ways of achieving multitasking:

- **Time slicing** requires the operating system to interrupt – using hardware – the current program, saving any necessary information and passing control on to the next program for a given period of time allocated by the operating system. Refinements of this involve allocating more time to programs which are particularly busy or have a high priority level and taking time away from others. This method is used on the Acorn Unix machine.
- Multitasking on the Archimedes utilises **Cooperative scheduling** via the Wimp. Programs which conform to the Wimp standard continually check to see if something has happened in their windows, if it has they act upon it and check the Wimp again. In the original Arthur window system that was it and only one program could use windows at any time.

Now, however, the Wimp is in overall control and whenever an executing program checks to see what's happening control is passed to the next program. The result is that whatever application you happen to be working on is the one that gets the most Wimp events, and hence it gets the most processor time associated with it. But it doesn't stop there, because every program is continually checking to see whether the Wimp has any new event for it so each one does get a slice of time. This means programs like the alarm clock can continually update their screen display and show the current time.

The only programs that don't multitask are those that don't use the Wimp – like the ADFS, so formatting stops the machine until it's finished. However that's not to say that you can't write a little Wimp-compatible Basic program to do formatting and have that running while you do something else.

## TIMESHARE BASIC

Most of the short programs available on the two utility discs are written in Basic, which means that you can have as many running in the machine at one time as there is memory available.

It's strange that with a machine with so much more ram space than the original BBC Micro, it is once more important to keep the overall size of programs down. After all, you can only have about eight to ten alarm clocks running at one time on a 310 because each one takes 64k.

However what you can't do is work on more than one program at a time using the Basic Editor – although you can use the !Edit program instead it doesn't have all the useful Basic-oriented facilities of the purpose-designed editor.

Under Risc OS the whole window moves continuously – no dotted line. It's hard to describe – the effect is quite stunning – but you can go back to rectangles if you wish. In addition, if you drag with Adjust rather than Select, the window does not come to the front but stays wherever it is in the stack. So you can move one around in the background sliding it in and out of any others on the screen – not only is it fun it can be quite useful when you are working with several windows and programs at once.

However the concept of dragging icons is not just restricted to moving files around on disc. Acorn is encouraging all software houses to conform to the standard where, if you are doing a save, an icon appears in a small window and you drag it to the place you want the document to be saved – for example, a directory window.

But the place that you save the file could also be another application. The best way to explain this is to illustrate it. Let's say you have typed in some text in the !Edit program and want to transfer it to !Draw. Since the Archimedes is multitas-

**Turn to Page 88 ▶**

## Availability

**The Risc OS from Acorn will not be available until April, and this series of articles has been written using a preview version. Also the disc software has not been finalised.**

**The new operating system, complete with four roms, two manuals and two discs packed with software, will be available for just under £30.**

## NAMING DISCS

To take full advantage of the Risc OS disc handling capability you should give all your discs meaningful names, rather than leaving them named by the date of creation. To do this just load the disc and click Menu on the drive icon, then select the Name disc option and type it in.

We thoroughly recommend naming the two applications discs as RiscDisc1 and RiscDisc2 so that when you get prompted to insert either you'll know exactly which one to grab.

◄ *From Page 87*

king, you can have both these programs running at once, so select save from !Edit and drag the icon into the !Draw window and release it. And the text is copied across – no special commands needed, at least not as far as you, the user, are concerned.

Of the three main programs supplied with the Risc OS, !Edit doesn't have a print option, so does that make it a waste of time? Not at all: Just load up the printer driver you want, then select save and drag the icon into the driver window and away it goes.

The underlying concept is one of messages. The new Wimp Manager has commands which allow programs to send and receive messages to each other. This is clearly illustrated by the !Help utility which, when loaded, continuously requests data from whatever application the mouse pointer is indicating and prints in its own window the help information sent back.

This means that properly written programs don't need to provide their own help windows, they just have a section to reply to help requests so if you want help you load up the utility, otherwise don't bother.

Isolation of function is the product of the multitasking concept.

Because you can have more than one program running at a time you can build short individual utilities which interact with one another to provide a customised system. The facilities provided allow you to load just the software you need and no more.

The icon bar at the bottom of the screen is now a much more dynamic thing. As multitasking programs are loaded and initialised they have the option of placing an icon on the right-hand side of the bar to indicate their presence and provide an entry point. Filing systems appear on the left, and if the bar gets too crowded it actually extends off the screen and scrolls as needed. All program tasks on the right provide a Quit option to remove them from the machine completely.

● *Next month we'll take a more detailed look at the software provided on disc and in particular !Edit, !Paint and !Draw.*

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| ***TV SYSTEM*** *128K* *Single 640K Drive* *UHF Modulator* *Bundled Software* | 319.00 |
| ***MONO SYSTEM*** *128K* *Single 640K Drive* *Bundled Software* *12" High Res Monochrome Monitor* | 349.00 |
| ***COLOUR SYSTEM*** *128K* *Single 640K Drive* *Bundled Software* *14" Medium Res Colour Monitor* | 481.00 |

### MONITORS

| | |
|---|---|
| **Phillips BM 7502** 12" Hi res. P31 Green Phospher Screen. CVBS input. Audio input Band width 20 MHz. 2000 CHRS Display | 68.00 |
| **Samsung 12" Mono White** | 89.00 |
| **Samsung 12" Mono Green** | 89.00 |
| **Samsung 12" Mono Amber** | 97.00 |
| **Samsung 14"** Mono Hi Res White | 97.00 |
| **Samsung 14"** Mono Hi Res Green | 97.00 |
| **Samsung 14"** Mono Hi Res Amber | 109.00 |
| **Samsung 14" CGA** | 249.00 |
| **Samsung 14" CGA/EGA** | 335.00 |
| **Samsung 14" VGA** | 335.00 |
| **Samsung 14" Multiscan** | 355.00 |

### COLOUR MONITORS

| | |
|---|---|
| **Phillips CM8833** 14"CVBS and RGB medium resolution colour monitor. IBM PC compatible. Fast blankup to enable superimposing. Stereo Audio. Ear phone socket. 600 dots x 285 lines vertical | 199.00 |
| ***Phillips CM8852*** 14" RGB professional med res colour. 700 dots x 285 | 251.00 |

### PARALLEL T SWITCHES

| | |
|---|---|
| Parallel T switch (2 way) | 15.00 |
| Parallel T Switch (4 way) | 25.00 |
| Auto Switch 4-1 | 69.00 |

### MITSUBISHI DISC DRIVES

Source 100% BBC compatible slimline disk drives. All drives supplied complete with formatting diskette, comprehensive users manual and all necessary cables. All drives are 40/80 switchable and have two years warranty.

| | |
|---|---|
| ***5¼" Drives without P.S.U.*** | |
| 400A Single 400K Double Sided | 98.00 |
| SD 802C Dual 400K Double Sided | 190.00 |
| ***5¼" Drives with P.S.U.*** | |
| 400B Single 400K Double Sided | 117.00 |
| SD 802E Dual 400K Double Sided | 204.00 |
| SD 802D Dual 400K Drives horizontally mounted in a monitor stand to fit both the BBC B and the Master series | 230.00 |
| Mitsubishi Bave drives uncased with 40/80 switch | 77.00 |

### WINCHESTER DISC DRIVES

| | |
|---|---|
| 20 Mbyte | 408.00 |
| 30 Mbyte | 432.00 |
| 40 Mbyte | 552.00 |
| 60 Mbyte | 672.00 |

**All Winchester come ready to plug into the Master 128.**

| | |
|---|---|
| ADFS RAM required for BBC | 26.00 |

## PANASONIC KX-P 1081

| | |
|---|---|
| PANASONIC KX-P1081. | 135.00 |

**Panasonic KX-P1081.** The faster and enhanced KX-P1081. 120 cps in draft mode. 24 cps in NLQ mode. Fully Epson RX80 and IBM Matrix and Graphics Printers compatible. Standard friction and tractor feed. Operator accessible print mode switch. Standard 8 bit parallel interface. RS232 interface is optional.

## NEC P2200 PINWRITER
## 275.00 + VAT

CHOOSE YOUR FREE GIFT
WITH EVERY NEC P2200
2 CHOICES OF GAINING
1. RECEIVE
FREE PRINTER CABLE
FREE PRINTER STAND
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OR
2. RECEIVE
FREE CUT SHEET FEEDER
**WORTH £59**
(WHILE STOCKS LAST – SO HURRY)

24-pin dot–matrix printer. Letter-perfect print, in several sizes, at 56 characters per seconds (cps). Or switches to draft mode for high-volume outputs at 168 cps. Built-in tractor that permits push or pull feeding.

**Print Rate:** High-speed draft: 168 cps. Standard draft: 140cps. Letter quality: 56 cps
**Printhead:** Impact, 24-pin dot matrix.
**Input Buffer:** 8K standard
**Graphic Resolution:** Up to 360 x 360 dpi

| | |
|---|---|
| CUT SHEET FEEDER | 59.00 |
| SERIAL INTERFACE KIT | 55.00 |
| FRONT CARTRIDGE | 25.00 |

## NEC MONITORS
### OFFICIAL NEC UK PRODUCTS

| | |
|---|---|
| **MULTISYNC PLUS** | 695.00 |

This 15 inch, high resolution (1024 x 768) monitor is ideal for use with IBM/XT/AT and PS/2 plus Apple Mac II and othe IBM PC compatible microcomputers. It automatically scans all horizontal frequencies from 21.8 KHz to 48 KHz and vertical frequencies ranging from 50 to 90 HZ. It supports EGA, enhanced EGA, PGC, MCGA, and VGA colour graphics standards.

| | |
|---|---|
| **MULTISYNC II** | 450.00 |

This redesigned 14" MultiSync high resolution monitor offers all the benefits of the previous model such as automatic synchronisation, suitable for use with IBM/XT/AT and PS2 plus Apple Mac II and compatible with Hercules, MDA, CGA, EGA, EGA+, PGC, and VGA graphics standards plus front mounted user controls and automatic selection of Analog/TTL and Vertical Hold modes.

| | |
|---|---|
| **MULTISYNC GS** | 149.00 |

Offers the user a high resolution (720 x 480), 14 inch monochrome display which is hardware compatible with IBM PC, XT, AT, and PS/2 machines. The MultiSync GS supports MDA, Hercules, CGA, EGA, MCGA and VGA display standards. It automatically locks on to one of five frequencies from 15.7 to 31.5 KHz to suppport all the above major graphics standards and three vertical frequencies ranging from 50 to 70 HZ.

### PC ADD ONS

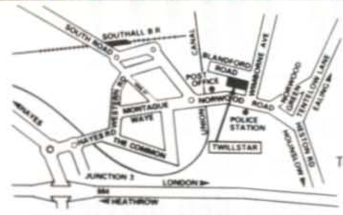
| | |
|---|---|
| 20 Mb Hard Disk | 199.00 |
| 30 Mb Hard Disk | 240.00 |
| 20 Mb Hard Card | 199.00 |
| 30 Mb Hard Card | 240.00 |
| Other PC products available. | Call for details. |

### SPECIAL PACKAGE

| | |
|---|---|
| **Phillips CM8833 Monitor and TV Tuner** | 249.00 |

**Save £45**

***Maintenance contracts available.***
***Authorised service centre.***
***Call for details 01-574 5271***



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**You can purchase any of the items listed. All you have to do is write your requirements on a sheet of paper, and we will despatch your goods within 24 hours, subject to availability. Please add the following amounts for Postage and Packing.**

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## PRINTERS

| | |
|---|---|
| ***AMSTRAD LQ3500 di*** 24 pin NLQ 160cps. LQ 54CPS. Prints graphics output. Supplied with bolt-on tractor and featuring PC and Epson LQ-1500 compatibility. (Subject to availability) | 260.00 |
| ***AMSTRAD DMP4000*** 200cps wide-carriage. Inbuilt tractors allow fast paper slew rates, and PC and Epson FX compatibility. (Subject to availability) | 250.00 |
| ***NEW PRINTERS*** | |
| **AMSTRAD DMP3250 di** | 169.00 |
| **AMSTRAD LQ5000 di** | 339.00 |
| ***STAR LC-10*** New enhanced version complete with IBM & Parallel Interface | 189.00 |
| Sheetfeeder | POA |
| ***STAR LC-10 Colour*** | 219.00 |
| Ribbon | 4.70 |
| ***MP135*** 135 cps, 80 column printer. Friction tractor feed. NLQ. Epson & IBM Compatible | 126.00 |

### EPSON PRINTERS

| | |
|---|---|
| LX-800 | 199.00 |
| FX-800 | 320.00 |
| FX-1000 | 399.00 |
| EX-800 | 420.00 |
| EX-1000 | 565.00 |
| LQ-500 | 299.00 |
| LQ-850 | 449.00 |
| LQ-1050 | 599.00 |
| LQ-2500+ | 720.00 |
| LQ-2550 | 899.00 |
| SQ-2500 | 969.00 |
| SQ-3500 | 1199.00 |

### NEC PINWRITER P9XL

| | |
|---|---|
| P960XL | 885.00 |
| P965XL Serial/Parallel | 970.00 |

### NEC SILENTWRITER LC866+/LC890

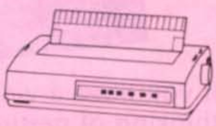
| | |
|---|---|
| LC866+ | 1870.00 |
| LC890 | 2995.00 |

FREE with Silentwriter 12 months onsite maintenance contract.

### NEC PINWRITER P5XL

| | |
|---|---|
| *P565XL Serial/Parallel* | *740.00* |
| *Pin tractor* | *50.00* |
| *Bi-directional tractor* | *125.00* |
| *Single bin cut sheet feeder* | *240.00* |
| *Double bin cut sheet feeder* | *440.00* |
| *Font cartridge* | *40.00* |
| *RAM cartridge* | *30.00* |

### NEW NEC PINWRITER P6/P7



*The ultimate matrix printer for business. Print speeds of 265cps in draft and 90cps in letter quality. Inbuilt tractors. A paper park and low tear off facility. Twenty inbuilt fonts as standard. A font cartridge facility for greater flexibility. An amazing 80K byte print bufer. 24 pin printhead. Centronics parallel interface. Compatible with previous NEC 24 pin printers.*

| | |
|---|---|
| ***P6+*** *80 characters* | *434.00* |
| ***P7+*** *136 characters* | *608.00* |

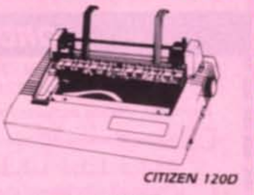
### DAISYWHEELS

| | |
|---|---|
| ***BROTHER HR 20*** Daisywheel 8K standard buffer upgradable to 16K. Standard serial/parallel port | 338.00 |
| ***JUKI Daisywheel*** Juki 6200 | 320.00 |
| **QUENDATA GPR-2000** Print speed of 18 characters per second. Fully Qume compatible. Takes Qume exchangable Daisywheel and ribbons. Selectable 10, 12 & 15 pitch. Supports proportional spacing. Standard friction feed. Tractor/cut sheet feeder and serial interface optional | 146.00 |
| **CITIZEN Daisywheel Premiere 35** 35cps 15" daisywheel. Diablo compatible | 399.00 |

## PRINTERS

| | |
|---|---|
| ***CITIZEN 120D*** *Dat Matrix Printer. 120cps NLQ. 2 year warranty. You have to see the quality at this price.* | *117.00* |
| ***CITIZEN LSP 100P*** 120/25cps 80 column Centronics IBM Parallel | 138.00 |
| ***CITIZEN MSP 15E*** 160/40cps 136 column Centronics IBM Parallel | 240.00 |
| ***CITIZEN HQ P40*** 80 column. 24 pin. Dual interface. | 350.00 |
| Colour Option | 50.00 |
| Colour Ribbon | 20.00 |
| ***CITIZEN HQ P45*** 136 column. 24 pin. Dual interface. | 310.00 |
| ***NEW CITIZEN 180E*** 175cps Draft Elite 30 NLQ. 4k Buffer. 2 year warranty. | *169.00* |

## PRINTERS



***CITIZEN 120D***

***CITIZEN HQP40***

1

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## Archimedes micro

### Winter Sale

| System | Basic | Mono | Colour |
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| 305 | £565 | £614 | £734 |
| 310 | £672 | £720 | £845 |
| 310M | £725 | £774 | £895 |
| 440 | £1999 | £2055 | £2189 |

(Securicor carr. £10 on Archimedes)

## ACCESSORIES

| | |
|---|---|
| ● NEW Multitasking RISC OS | £29 |
| ● 0.5,Mb RAM for 305 | £139 |
| ● ROM Podule Acorn | £56 |
| ● ROM Podule (Computer Concepts) | £45 |
| ● ROM Podule (C C) with Battery Backup | £59 |
| ● 2 Podule Backplane + Fan (Acorn) | £37 |
| ● 2 Podule Backplane (Watford) | £25 |
| ● 4 Podule Backplane (Watford) | £38 |
| ● Backplane FAN only (for Hard Disc) | £9 |
| ● 2nd 800K Floppy Drive (305/310) | £118 |
| ● I/O Podule (with Analogue port, User port, & 1MHz bus) | £80 |
| ● MIDI add-on to I/O Podule | £37 |
| ● MIDI Expansion Card | £65 |
| ● Sound Sampler (Armadillo) | £104 |
| ● Chromalock Podule | £280 |
| ● 20 Mb Hard Disc & Controller Card | £469 |
| ● Watford's latest 20 Megabyte Hard Disc, Controller Card & Utilities Software | £379 |
| ● Econet Network Board | £40 |
| ● Archimedes IEEE Interface Adaptor | £269 |
| ● Dual RS232 Podule | £195 |
| ● 16 bit parallel I/O Card | £195 |
| ● PC Emulation Pack incl. MSDOS 3.21 | £65 |
| ● Archimedes Reference Manual | £29 |
| ● Artm Assembly Lang. Prog. Manual | £12 |

### WORDPROCESSORS

| | | | |
|---|---|---|---|
| Wordwise + | £18 | Pipedream | £89 |
| Image Writer | £25 | P. Spellchecker | £48 |
| Interword ROM | £35 | View | £49 |
| 1st Word Plus | £75 | Viewspell | £32 |
| Archie Spell Master | £49 | ViewIndex | £12 |

### DATABASES

| | | | |
|---|---|---|---|
| AlphaBase | £39 | Flying Start II | £80 |
| Viewstore | £49 | System's Delta + | £60 |

### SPREADSHEETS

| | | | |
|---|---|---|---|
| Intersheet ROM | £35 | Viewsheet | £49 |
| Sigmasheet | | | £59 |

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| | | | |
|---|---|---|---|
| GammaPlot | £59 | Interchart ROM | £25 |

### INTEGRATED PACKAGES

**Logistix** – Database, Spreadsheet, Time Management & Business Graphics

£94

### GRAPHICS, ART & DESIGN

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| Artisan | £31 | Gamma Plus | £60 |
| Pro Artisan | £140 | Graphic Writer | 23 |
| Support Disc | £16 | Autosketch | £69 |
| Toolkit (Beebug) | £32 | Toolkit (Clares) | £31 |
| Arc Termulator | £56 | Zarch | £16 |
| Alerian | £12 | Conquerer | £20 |
| Minotaur | £11 | Missile Control | £13 |
| Kermit | £46 | Enthar Seven | £29 |
| Archeffect | £20 | Arc PCB Designer | £82 |
| ArcTFS | £25 | Lingenuity Presenter | £24 |

## Computer Concepts' Archimedes Software on DISC

| | | | |
|---|---|---|---|
| Inter-Word Disc | £27 | Inter-Sheet Disc | £27 |
| Inter-Chart Disc | £17 | Spell-Master Disc | £48 |

### LANGUAGES

| | |
|---|---|
| ANSI 'C'; ISO-PASCAL; FORTRAN 77; | £94 each |
| Cambridge LISP; PROLOG X | £181 each |
| LOGOTRON LOGO | £55 |
| BASIC Compiler | £89 |
| Archimedes Assembler | £189 |
| TWIN EDITOR | £27 |

## MINERVA's Archimedes Software

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|---|---|---|---|
| Sigmasheet | £57 | Gammaplot | £57 |
| Deltabase | £24 | Sys Delta + | £57 |
| Sys Delta + Ref Manual | | | £25 |
| Order Processing* | £53 | Sales Ledger* | £53 |
| Stock Manager* | £53 | Purchase Ledger* | £53 |
| Nominal Ledger* | £53 | Reporter | £20 |
| School Administrator | | | £66 |

** Requires System Delta*

## Archimedes to BBC SERIAL LINK

Using this simple data link, it is possible to solve all your BBC to Archimedes data transfer problems. The kit is supplied with a disk, and the necessary cable to connect the two computers. Using this package it is possible to transfer any data from the BBC to Archimedes at upto 19200 baud.

**Only £15**

## Archimedes 5¼"/3½" Disc drive Interface

With this interface it is possible to connect almost any 5¼"/3½" disc drive with its own power supply to the Archimedes. NO SOLDERING is involved. Supplied complete with necessary lead.

**Only £21**

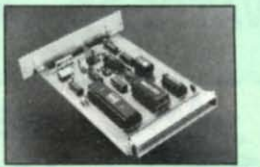
Note: This is not simply a lead. Attempting to connect an external disc drive by direct connection may result in damage to your Micro.

New

## Watford's 20Meg Archimedes Hard Disc

Watford Electronics' 20Meg hard disc fits internally into the Winchester slot provided. It is fully compatible with Acorn's hard disc upgrade, (the only difference is our low price). The price includes the Hard Disc Drive, Controller Podule & fitting instructions.
P.S. This upgrade requires a backplane and a fan.

| | |
|---|---|
| Type Arch-HD20 | £379 |
| Backplane for 2 Podules | £25 |
| Backplane for 4 Podules | £38 |
| Slimline Quiet Extractor Fan | £9 |



CREDIT TERMS now available.
Please telephone or write in for further information.

## BBC MASTER

**MASTER** 128K Micro incl. Acorn's: View, Viewsheet, ADFS, BASIC Editor & TERMINAL plus £35 worth of FREE OFFER (see below) **£345**

**FREE . . . £35 worth of Software**

*Gemini's OFFICE MATE & OFFICE MASTER packages on Disc consisting of: Database, Spreadsheet, Beebplot graphics. Accounts packs: Cashbook, Final Accounts, Mailist, Easyledger, Invoice & Statements, Stock Control. With every BBC Master purchased from us this month.*

**BBC MASTER with Turbo Board + above SPECIAL OFFER £474**

512K Processor Add on Board "inc. Mouse and GEM package" **£119**

**BBC MASTER plus 512K 80186 Co-processor Board (incl. Mouse and GEM package) plus the above £35 worth of SPECIAL OFFER £475**

Securicor Carriage on Micros £7

## ADD-ONs & ACCESSORIES

| | | | |
|---|---|---|---|
| Turbo 65C102 Add-on Module | | | £118 |
| Econet Module for the Master | | | £40 |
| Twin ROM Cartridge for Master | | | £8 |
| Quad ROM Cartridge for Master | | | £12 |
| Universal Processor Adaptor | | | £75 |
| Master Reference Manual I | | | (No VAT) £14 |
| Master Reference Manual II | | | (No VAT) £14 |
| Master Advance Ref. Manual | | | (No VAT) £18 |
| 64K Upgrade Kit for B+ | | | £32 |
| Acorn 1770 DFS Kit complete | | | £49 |
| ECONET Upgrade Kit for BBC | | | £42 |
| ALL ECONET UPGRADES Available | | | |
| ARIES' Professional IEEE Interface | | | £238 |
| Morley Teletext Adaptor with ATS Rom | | | £99 |
| Filestore E01S | £899 | Filestore E40s | £799 |
| Filestore E60S | £1080 | Ecolink | £270 |

## BBC MASTER COMPACT

| | | |
|---|---|---|
| System 1 | Standard Package | £305 |
| System 1A | System 1 + TV Modulator | £329 |
| System 2 | System 1 + Green Hires Monitor | £359 |
| System 3 | System 1 + Medium Res Colour Monitor | £469 |
| RS232 Kit for BBC Compact | | £25 |
| Additional 3½" Drive for BBC Compact | | £90 |

(Securicor carriage £10)

## VOLTMACE JOYSTICKS

| | |
|---|---|
| Delta 3B Single Joystick | £10 |
| Delta 3B Twin Joysticks | £15 |
| Delta 3C Joystick for Compact | £10 |
| Delta 14B Single Joystick | £11 |
| Delta 14B/1 Adaptor Module | £12 |
| Transfer Software Disc-Tape | £7 |

## ATTACHE CARRYING CASE

For the BBC Micro. Attractively finished in antique brown leatherette. Lockable.

Only **£10** (£2 carr.)

Continued →

# CO-PRO Adaptor

CO PRO ADAPTOR

With this Watford's Co-pro Adaptor unit, you can now attach any BBC Master's coprocessors to your original BBC B.

Use the super fast Turbo Board with your BBC B, it is much faster than the 6502 2nd processor superseding it.

With the 512K addon your standard BBC machine achieves IBM PC compatibility at a realistic price running GEM, Lotus 123 and many other programs. Included with the 512k package is a high precision mouse and the Digital Research GEM suite of software; GEM Desktop, GEM Write GEM Paint. This requires both the 1770 DFS and the ADFS to be fitted to your computer.

To use other co-processors you require a BBC B with DNFS 1.20 or higher, or BBC B+ fitted with 1770 DFS 2.20 or greater. Co-processors work exactly like a second processor.

Master owners may use Co-Pro Adaptor to add a second Co-processor externally.

Watford, brings power to your BBC at only:

**£35** (carr £5)

---

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## Versatile **BEEB SPEECH SYNTHESISER** Unit

Beeb Speech Synthesiser

The Watford Speech Synthesiser is a very flexible speech synthesis unit based upon the powerful phonemes system. This system stores the building blocks of speech (called phonemes) and allows you to combine them quickly and easily to form virtually any word imaginable.

Supplied with an advanced ROM, you are provided with a 500 word dictionary to get you started. These can easily be added to by following the notes given in the comprehensive manual.

**SPECIAL PRICE £32** (carr £2)

---

## 65C102 2nd PROCESSOR

This amazing package consists of the Acorn 65C102 'Turbo' Board, the Watford Co-Pro Adaptor and Acorn 1.2 DNFS ROM. The 'Turbo' board, running at 4MHz with 64k of additional RAM will increase the speed by between 50 and 200% depending on the application running, and allow a BASIC program of upto 44k in any screen mode. Simply by plugging in the Co-Pro and the DNFS ROM with its special Tube host code and you massively increase the power of any Model B. This is a complete package, with its own power supply, ready to interface with your BBC Micro.

**£159**

**By Popular demand we are now supplying refurbished and fully guaranteed BBC Micro Model B with Disc Filing System**

(Please telephone for price & availability)

---

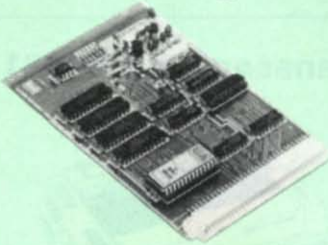
## The 80186 Co-Processor

This package consists of the Master 512 board, Watford Co-Pro Adaptor, 1770 Disc Upgrade and Acorn ADFS. This is a complete package, with its own power supply, ready to interface with your BBC Micro. The Master 512 board using the 80186 16 bit Processor at 10MHz and running Digital Research DOS Plus, gives a high degree of IBM compatibility at an extremely reasonable price. Included in the 512k package is a mouse and the amazing Digital Research GEM suite of software; GEM Paint, GEM draw and GEM desktop giving a complete Mouse Icons environment (All other GEM packages will work on the 512k). Famous packages that will work with the 512k board include Wordstar, Dbase II, Lotus 123 and many others. The only requirement to upgrade any BBC Model B to this system is you must have twin 80 track disc drives.

New low price **£219**

---

## Archimedes Real-Time Digitiser



Watfords' Archimedes Video Digitiser is the most sophisticated digitiser ever designed for a micro. It provides a fast and flexible means of capturing images from a video camera or recorder for display and manipulation on the Archimedes range of Micros. Off-air television signals may also be digitised via a video recorder or TV tuner.

Once captured, Video images can be stretched, squahsed, rotated, stored on disk, printed, or used by applications software.

Applications include desktop publishing, graphics, animation, image analysis and recognition, medical imaging, automatic inspection and measurement, databases, interactive video, remote transmission of pictures via a modem, movement detection ... or anything else you can think of!

### SPECIFICATION

**SOFTWARE**

All the driver software for the digitiser is contained in a ROM on the podule. Facilities provided include:

- Grabbing of images to the screen or dumping to memory.
- Continuous grabbing and display for previewing or camera alignment.
- 'Hot key' grabbing – pressing a (configurable) key combination grabs and displays an image on the screen while another program (e.g. paint software such as Artisan) is running.
- Scaling (zoom/shrink) any section of an image to any size in X and Y directions, with optional X/Y flip, window clip and logical (AND/OR/XOR) plotting.
- Rotation and scaling to any angle and size, rotating about any point, with optional window clip, and logical (AND/OR/XOR) plotting.
- Very versatile matrix printer screendump facility for Epson FX, LQ and EX compatible printers – pictures can be printed to ANY size (including multiple sheets) at any orientation, using any available printer density and one of six internal sets of dot patterns, or with user definable patterns (pattern editor supplied). The screen-dump can also be used for general purpose graphics screen printing.
- Pixel value lookup tables: pixel values can be passed through a user defined lookup table to allow contrast enhancement, thresholding pseudo-colouring etc.
- Smoothing and noise spot removal to enhance image quality.
- Creation of sprites from all or part of a digitised image.
- Saving and loading of digitised images in compressed format.
- Combination of pictures by adding, avaraging, subtracting, multiplication etc.
- Much faster versions of the Arthur *ScreenLoad and *ScreenSave commands.

Software facilities are accessed via operating system star (*) commands and SWI calls. High resolution screen modes using MultiSync type monitors are supported.

**UTILITY DISK**

A disk is included, containing sample pictures, examples and utility programs including the following:

- Colour image grabbing using colour filters with monochrome or colour cameras, including colour balance adjustment and scaling facilities.
- Pattern editor for 2 colour display modes and printer screendumps.
- 512 line interlaced display for non MultiSync monitors.
- Thresholding to create two colour images.
- Capture and replay of animated sequences.
- Several example programs illustrating the use of digitiser software.

**RESOLUTION**

Images are digitised to 512 (h) x 256 (v) pixels, and then scaled to fit the Archimedes' screen. It is possible to digitise to 512 x 512 pixels if the picture is stationary for about 0.1 second. 512 x 512 images can either be displayed on a MultiSync monitor, or on a normal monitor using interlacing.

Pictures are digitised to 64 levels of grey (6 bits). Note, however, that it is only possible to display all 64 levels on a monochrome monitor, or a colour monitor which has a composite (CVBS) input. For this reason, the Philips CM8533 monitor is recommended instead of the standard Archimedes monitor. It is also possible to connect both a colour and a monochrome monitor at the same time.

Any 2,16 or 256 colour graphics mode can be used to display digitised pictures. In two colour modes, grey levels are represented using dot patterns, which may be redefined if required (a pattern editor is supplied).

**Cont.**

**SPEED**

Video fields are captured in real time (1/50th sec.), and then transferred to Archimedes' memory or the screen. The grab/display rate is dependant on the screen mode and picture size, up to 25 fields per second for quarter screen images, or 12.5 per second for fullscreen (Mode 9).

**HARDWARE**

The digitiser is a single width podule, with a BNC socket on the rear panel for the video input, which may optionally be terminated via a link. There is 128K of on-board memory to store the digitised image, and a 32K ROM on the podule contains all the driver software.

Automatic video level control and black level clamping circuitry is used to ensure that the optimum contrast is obtained from a variety of video sources. A filter is included to avoid patterning effects when using colour sources.

**Price £249**

---

## Z88 Sinclair's Portable Micro

The worlds first, truly portable Micro. It is A4 size, only an inch thick and weighs under 2lbs. Ideal for use when travelling or as a personal organiser.

Only: **£239**

### FREE

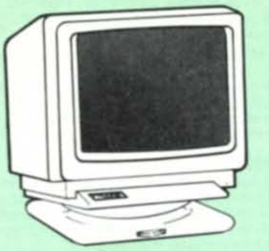
With every Z88 purchased from us this month, we are giving away absolutely FREE, a Z88 to BBC Interface Link, 4 rechargeable batteries and a compact Mains Battery Charger worth £38.

### ACCESSORIES

| | |
|---|---|
| Mains Adaptor | £8.65 |
| 32K RAM Pack or 32K EPROM Pack | £17.35 |
| 128K RAM Pack or 128K EPROM Pack | £43.40 |
| 512K RAM Pack | £169 |
| Z88 Spellmaster for Pipedream | £51 |
| Z88 to BBC Link | £21.70 |
| Z88 to PC Link II | £30 |
| Z88 to Macintosh Link | £49 |
| Z88 EPROM ERASER | £34.75 |
| Serial Printer Cable | £8.65 |
| Parallel Printer Cable | £24.00 |
| Z88 Modem | £145 |
| Z88 Soft Carrying Case | £8.50 |
| Sinclair Z88 Computing Book | £9.95 |
| AA Nicad Rechargeable Battery | £1.50 |
| Battery Charger, Compact & Fast (3 Hours) | £6 |

Continued →

## MONITORS &



**All Monitors are supplied complete with BBC connecting leads FREE.**

### MICROVITEC 14"

| | |
|---|---|
| ● 1431 – Standard resolution as used on the BBC television computer programme | £175 |
| ● 1451 – Medium resolution, suitable for word processing in mode 0 | £219 |
| ● 1441 – High res, exceeds the capabilities of the BBC micro | £359 |
| ● 1431AP RGB + PAL and AUDIO | £199 |
| ● 1451AP RGB + PAL and AUDIO | £255 |
| ● **2030 CS 20" Med Res** | £380 |
| ● **2040 CS 20" Hi Res** | £675 |
| ● Dust Cover for Microvitecs | £5.50 |
| ● **Touchtec 501 Touch Screen** | **£239** |

### TAXAN 12"

| | |
|---|---|
| ● TAXAN Super Vision 2 Type 620 Hi-res RGB Colour, Green/Colour Switch | £265 |
| ● TAXAN Super Vision 3 – Type 625 Super Hi-res RGB Colour, Green/Colour Switch | £315 |

### 14" MULTISCAN COLOUR

| | |
|---|---|
| ● **TAXAN** Multisync 770 Plus | £449 |
| ● **EIZO** Flexscan 80605 – For technical info. read the review in Micro User, Jan. '89 | £459 |
| ● **NEC** JC-1402P – Multisync II | £456 |

NEW

### Aries 1458 14" Multisync

Aries 1458 is a state of the art, stylishly finished, flat screen, Enhanced Multiscan Colour Monitor. An auto-switching device changes modes without having to adjust the monitor (it also works in monochrome). Its wide frequency range (15-45KHz) and multi-colour display allows increased options and flexibility. 0.31mm dot pitch. Input Signal: TTL/Analogue, H-Sync 15-45KHz; V-Sync 47-100Hz; Bandwidth 35MHz; Resolution 800 x 600 Hi-resolution Multi colour Display; Display Colours CGA-16, Mono-Green (3 levels), EGA 64, Analogue – limited only by the video display adaptor; Built-in tilt and swivel base.

**(FRO IBM PCs & Compatibles ONLY)**

Launch offer **£349**

### PHILLIPS

| | |
|---|---|
| ● BM7502 12" Hi-res Green Monitor | £65 |
| ● CM8833 14" Med. Res Colour Monitor | £219 |

### STAR BUY

- **PHILLIPS 14"** Medium Res, dark glass, attractively finished Colour Monitor – supplied complete with RGB, SKART and Audio/Phono Inputs. A push-button switch toggles between Hi-Res monochrome green text mode and full colour display. (Please state the type of Connecting Lead you require).

**ONLY £199**

| | |
|---|---|
| Dust Cover for Phillips Monitors | £6 |

### SPARE LEADS

| | |
|---|---|
| **BNC Lead for Zenith or Philips** | £3 |
| Skart Monitor Lead | £5 |
| RGB lead for TAXAN Monitors | £3 |
| Archimedes Colour Monitor Lead | £7.50 |

## SWIVEL BASES

By simply placing your monitor on one of our front adjustable professional swivel bases (see drawing on the left), you can easily adjust the monitor viewing angle.

for 12" Monitors **£8** (carr. £2.50)
for 14" Monitors **£12** (carr. £2.50)

## Anti-Glare VDU Screen

These extremely effective, easy to install, 12" & 14" VDU screens eliminate harmful glare, improves contrast on colour monitors. Increases productivity in offices. A must for all wordprocessor users.

**£12**

## TAXAN KP-815 PRINTER

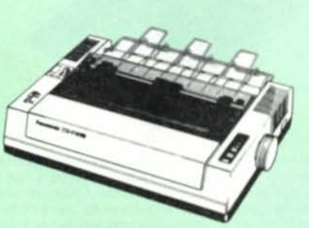
80 column, Bi-directional, 160 CPS, (NLQ 24cps); Friction & tractor feed + paper roll holder as standard; Epson FX compatible.

### Offer Price £155

**Taxan KP915** 132 Column Printer
**£275** (carr £7)

| | |
|---|---|
| RS232 Interface | £49 |
| RS232 Interface with 2K Buffer | £69 |
| RS232 Interface with 16K Buffer | £89 |

## Panasonic KX-P1081



Attractively finished in BBC beige. Bi-directional, logic seeking. Has IBM and Epson RX compatible command calls. Speed: 120CPS draft mode, 24 CPS NLQ mode. Character width range from 5 cpi to 17 cpi. Upto 40 downloadable characters. Functions include, Proportional spacing, Justification, centering and left & right ranging.

***(Price inludes, FREE a 4ft Printer Lead, and a Dump Out 3, Screen Dump ROM worth £35 with every printer purchased from us).***

*WINTER SALE OFFER only:* **£139**

| | |
|---|---|
| Optional RS232 Interface: | £39 |

## PANASONIC PRINTERS

| | |
|---|---|
| ● KX-P1124 24pin 80col. 192/63 CPS | £349 |
| ● KX-P1180 9pin 80col. 192/38 CPS | £169 |
| ● KX-P1540 24pin 80col. 240/80 CPS | £449 |
| ● KX-P1592 9pin 136col. 216/45 CPS | £295 |
| ● KX-P1595 9pin 136col. 288/61 CPS | £409 |
| ● Panasonic KX-P4450 LASER PRINTER Latest technology at Watford's special offer price | £1,540 |

● Spare Toner **£29** ● A4 Feeder **£55**

## PRINTER LEADS

| | |
|---|---|
| BBC Centronics 4' long | £5 |
| BBC Centronics 6' extra long | £7 |
| Compact's Special Centronics Lead | £7 |
| Archimedes Printer Lead 1 meter | £6 |
| IBM Parallel Lead 1 meter | £6 |
| Double Ended 36 way Centronic Lead 4' | £7 |
| Double Ended 36 way Centronics Lead 6' | £9 |
| MSX Centronics Parallel Lead 4' | £12 |
| RS232 Leads (Various) | P.O.A. |

## RS-232 GENDER CHANGERS

| | |
|---|---|
| Male to Female | £4.95 |
| Male to Male | £4.95 |
| Female to Female | £4.95 |

## INTEGREX COLOUR JET PRINTER

| | |
|---|---|
| ● Colour Jet 132 Printer | £515 |
| ● Paper Roll | £6 |
| ● Screen Dump Software | £10 |
| ● Colour Cartridge | £14 |
| ● Black Cartridge | £8 |
| ● 100 A4 OHP transparencies | £55 |
| ● 8K Serial Interface Optional | £123 |
| NEW – Intergrex COLOURCEL NPQ Ink Jet Colour Printer | £2,695 |

## NEC P2200 PINWRITER

24 pin; 80 column; 168CPS – 56CPS LQ; Epson LQ compatible, 7K Buffer; 7 resident FONTS, Friction & Tractor feed, front load single sheet feed, etc.

**Price: £269**

| | |
|---|---|
| Pinwriter Serial Interface (optional) | £55 |
| P2200 Cut Sheet Feeder | £65 |
| Additional Font Cartridge | £25 |
| NEC P2200 Pinwriter Ribbon | £6 |

## NEC PINWRITER P6/P7 Plus

The Ultimate 24pin matrix Printer for Business.

| | | | |
|---|---|---|---|
| P6 Plus 80 columns | £439 | P7 Plus 136 columns | £575 |
| Colour Option | £74 | Serial Interface | £73 |
| Cut Sheet Feeder | £125 | | |

| | | | |
|---|---|---|---|
| **Star LC10** | **£175** | **LC10 Colour** | **£215** |
| **Star LC24-10** | **£279** | **NB24-10** | **£399** |

| | |
|---|---|
| **Brother HR20 DaisyWheel Printer** | **£339** |

## EPSON PRINTERS

| | | | |
|---|---|---|---|
| EX800 | £405 | LQ850 | £430 |
| EX1000 | £564 | LQ1050 | £570 |
| FX850 | £315 | LQ2550 | £925 |
| FX1000 | £425 | LQ2500+ | £839 |
| FX1050 | £439 | LX800 | £175 |
| LQ500 | £275 | SQ2500 | £975 |
| GQ3500 Laser | £1150 | | |

### PLOTTERS

| | |
|---|---|
| Hitachi 672 Colour Plotter | £475 |
| Plotmate Plotter A4S | £379 |
| Plotmate Plotter A3M | £549 |

### CUT SHEET FEEDERS for

EX800 **£149**; EX1000/LQ2550 **£210**; FX800 **£149**; FX1000 **£179**; LQ/LX800 **£139**; LQ500 **£75**; LQ850 **£135**; LQ1050 **£175**.

### TRACTOR FEED for

EX800/1000 **£85**; LQ800 **£44**; LQ850 **£69**; LQ1050 **£85**; LQ2500 **£195**

### ACCESSORIES

| | |
|---|---|
| ● EX800/1000 Colour Option | £55 |
| ● EX800/1000 Colour Ribbon | £18 |
| ● LQ2500 Colour Option | £65 |

**(Securicor Carriage on Printers £7**

## EPSON PRINTER INTERFACES

All these interfaces fit inside the printer.

| | | | |
|---|---|---|---|
| RS232 | £32 | RS232 + 2K Buffer | £52 |
| IEEE 488 | £40 | RS232 + 8K Buffer | £79 |

## Universal Printer Sharers/Changers

Connect upto 5 Micros to 1 printer or 5 Printers to 1 Micro with our combined, Sharer/Changer. These Units are made to a very high standard. For extreme reliability, they all have Printed Circuit Boards mounted inside the case, (not a Spagetti Junction of wires). Internal connection is made via high quality ribbon cables.

**(Ideal for School environments.)**

| **Connects** | **Serial** | **Centronics** |
|---|---|---|
| 2 to 1 | £20 | £22 |
| 3 to 1 | £27 | £30 |
| 5 to 1 | £36 | £39 |

(Cables extra at £5 each. Please specify type required when ordering)

## Listing Paper (Perforated)

| | |
|---|---|
| ● 1,000 Sheets 9½" × 11" Fanfold Paper | £7 |
| ● 2,000 Sheets 9½" × 11" Fanfold Paper | £12 |
| ● 1000 Sheets 9½" x 11" NCR 2 Part Fanfold | £19 |
| ● 1,000 Sheets 15" × 11" Fanfold Paper | £9 |
| ● 1000 Sheets true A4 Fanfold Paper | £11 |
| ● 2000 Sheets true A4 Fanfold Paper | £19 |
| ● Teleprinter Roll (Econo paper) | £4 |

(All our Fanfold paper is Micro perforated leaving a smooth clean edge when the tractor feed strips are detached).

Carriage 1K Sheets £2.50. 2K Sheets £3.00

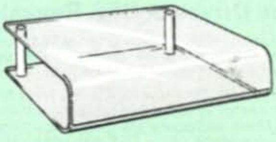
## PRINTER LABELS

### (On continuous fanfold backing sheet)

| | | |
|---|---|---|
| 1,000 | 90 × 36mm (Single Row) | £5.00 |
| 1,000 | 90 × 36mm (Twin Row) | £4.90 |
| 1,000 | 90 × 49mm (Twin Row) | £7.50 |
| 1,000 | 102 × 36mm (Twin Row) | £6.25 |

Carriage on 1,000 Labels £1.00

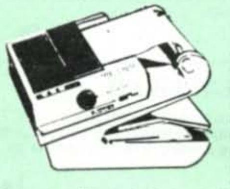
## Perspex Printer Stand



Give your Computer System a touch of Class with our elegant, smoke finished Perspex Printer stand. The printer sits on top and the fanfold paper rests neatly underneath, thus occupying the same space as the printer footprint.

**Only: £16** (carr. £3)

## Professional Printer Stand



This new professional printer stand takes hardly more space than your printer. Due to the positioning of the paper feed and re-fold compartments ie. one above the other, the desk space required for your printer functions is effectively halved. Additional facilities include: Easy access to paper from both sides, used with both top and bottom feed paper and with its dial controlled paper feed system with adjustable deflector plates it ensures smooth paper flow and automatic refolding.

***80 Column version £23** (carr. £3)*

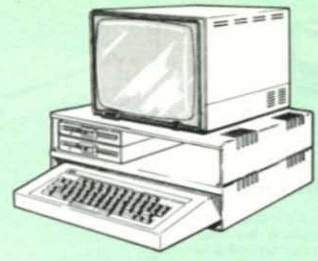
***132 Column version £26** (carr. £3)*

## PRINTER RIBBONS & VARIOUS DUST COVERS

| Type | Ribbons | Dust Covers |
|---|---|---|
| **BBC Micro** | – | £3.50 |
| **BBC Master** | – | £4.00 |
| **Archimedes Micro pair** | – | £9.00 |
| **IBM PCs pair** | – | £6.00 |
| **Brother HR15/20** | £3.00 | £5.00 |
| **DMP2000** | £3.75 | £4.75 |
| **EX/LQ800** | £4.50 | £4.50 |
| **EX/LQ1000** | £7.50 | £5.00 |
| **RX/FX80/85/800/MX80** | £3.90 | £4.95 |
| **RX/FX100/1000** | £5.75 | – |
| **Kaga/Taxan KP810/815** | £4.90 | £4.00 |
| **LC10 (Black)** | £4.25 | £5.00 |
| **LQ500/800** | £3.75 | £5.00 |
| **LQ1050/LQ2500** | £8.50 | £5.50 |
| **LX80/86/800** | £3.80 | £4.50 |
| **M1009/GLP** | £3.80 | £3.75 |
| **Panasonic KX1080/81** | £4.00 | £4.75 |
| **SQ2500** | £23.00 | £5.50 |
| **Star NL10** | £3.75 | £4.50 |
| **Olivetti Ink Jet Cartridges (set of 4)** | £9 | |

Our attractive Dust Covers are manufactured from translucent PVC. The seams are stitched and edges are taped to prevent splitting due to continuous use.

## PLINTHS FOR BBC MICRO, MASTER & PRINTERS



Protect your computer from the heat of your VDU. Our micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and VDU, whilst the double height version provides enough room for our stacked disc drive and other peripherals like, Eprom programmer, music unit or simply discs & stationary. The computer slides neatly in the lower section allowing easy access to remove the lid.

The single printer stand is equally sturdy but instead of cooling slots it has elegant cutouts on the sides. This allows easy access to paper from all sides. Colour: BBC Beige.

| | |
|---|---|
| Single BBC Plinth | **£12** (carr. £2) |
| Double BBc Plinth | **£20** (carr. £3) |
| Printer Plinth | **£12** (carr. £2) |
| Single Master Plinth | **£13** (carr £2) |
| Double Master Plinth | **£24** (carr £3) |

## REPLICA 3

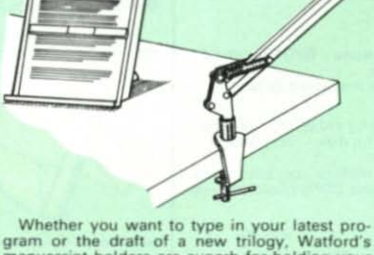
This new improved REPLICA 3 from Clares is a very powerful disc based TAPE to DISC Utility. It now transfers even more programs than ever before. Replica 3 will not work with all programs but then neither will anything else. 30,000 Replicas have been sold to date. It has to be good.

**£15** (40 or 80 track)

**Acorn's Speech Synthesiser package, complete**

**Special Offer £18**

## Copy Holder



Whether you want to type in your latest program or the draft of a new trilogy, Watford's manuscript holders are superb for holding your paper at the ideal height and angle to allow you to read and type in ease and comfort.

Available in 2 full A4 versions, desk resting and shelf clamping. Paper is held firmly by means of a plastic retaining ruler and a clip grip. (for resting books or magazines, the desk top version is recommended).

Desk Top **£10** (carr. £3)

Angle poise **£14** (carr. £3)

## MEGABUFFER 256

The Smallest 256K Printer Buffer Unit in the world **38mm x 130mm x 134mm**.

This new Megabuffer 256 from Watford is a full featured 256K Printer Buffer. It allows the computer to print 256,000 character in a short time thus freeing the computer very quickly. In short it makes light work of printing large documents, screen dumps, etc. It is extremely simple to connect. The features are:

- ● Improves efficiency by making more efficient use of computer and printer.
- ● Compatible with any computer and printer that uses Centronics Parallel connections including all BBCs, IBM PCs, etc.
- ● Total compatibility with all software.
- ● Cheaper phone bills when using your Modems.
- ● Ideal for those doing large graphics screen dumps that are slow to print.
- ● Multi-Copy facility allows you to print several copies via Megabuffer without going through your computer.
- ● Data Dump facility is included.
- ● Built in test unit for both the buffer & your printer.

In conclusion it can safely be said that MEGABUFFER 256 is the ultimate printer Buffer for both the amateur and professional user.

**Only £149** (carr £5)

## OKIMATE COLOUR PRINTER

The first ribbon transfer printer in its price range which offers fully versatile colour or black printing. A 24 element print head produces more than 100 shades with exceptional clarity. Ideal for use with Quest Paint or AMX Super Art.

Only: **£119**

| | |
|---|---|
| BBC Screen Dump | £10 |
| Colour Ribbon | £6 |
| Black Ribbon | £6 |

## THE EPSON RX-FX-KAGA PRINTER COMMANDS REVEALED

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX-KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English, how to use and make the most of your KP810, PW1080A or any other Epson FX80 compatible Printers like Panasonic KX-P1080/1, etc., with the BBC Micro, both from BASIC and Wordwise.

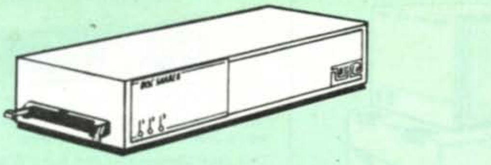
It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

**£5.95** (No VAT)

**CREDIT CARD 24 HOUR Ansaphone Hot Lines (0923) 50234 or 33383**

Continued

# DISC DRIVE SHARER



## (Ideal for educational establishments)

At last, a low cost alternative to the Econet system. Watford's Intelligent Disc Drive Sharer allows you to connect 3 BBC micros (model B, B+ and Master series) to a single or double disc drive. Running under any DFS or DDFS, this intelligent unit will automatically queue the computers. Each computer has a status light dedicated to it. If it is green you will get immediate access to the disk, and red means that you are next in line. The unit plugs directly into the disc drive socket on each computer and is powered by the mains. (N.B. Not for use with ADFS.)

Launch Price: **£65** Price includes 3 Cables

---

## NOW WITH EXTRA FEATURES AT NO EXTRA COST – Watford's latest DFS 1.44

- Incorporates Acorn's Official Tube Host Code so that those with 2nd processors no longer need to waste a ROM socket on the DNFS.
- Option to DOUBLE the speed of BPUT and BGET.

## WATFORD's & ACORN's DFSs

*Watford's popular and widely acclaimed DFS has now been available for six years and has gained a large following amongst serious and educational users of the BBC Micro. Owners of Acorn or any other standard DFS can upgrade to our "Ultimate" DFS merely by replacing their DFS ROM. See below for this upgrade.* ***(P.S. Watford's highly sophisticated DFS is fully compatible with Acorn standard DFS). (while Acorn's 1770 DFS is fully compatible with Watford's Mk II DDFS)***

- *DFS Manual (Comprehensive)* *(no VAT)* **£6.95**

  *(P.S. Our DFS manual is the only comprehensive Manual available for the BBC micro and covers both Acorn & Watford DFSs).*
- *Watford's sophisticated DFS ROM only* **£16**
- *We will exchange your existing DFS ROM for Watford's Ultimate DFS ROM for only* **£12**
- *DNFS ROM only* **£17**
- *ADFS ROM only* **£25**

(The Single Density DFS system is now old technology. Like Acorn, Watford too have decided to replace it with their more up-to-date 1770 DDFS interface. We have informed most of the software houses of this decision in order that they can ensure compatibility with our highly sophisticated and fully Acorn compatible DDFS).

NEW

# Watford's MkII 1770

## Double Density DFS Interface

Many of our customers have wanted to use our superior DDFS and Acorn ADFS together. Now our Mk II DDFS Board with its 1770 Disc Controller, has been adapted to allow the use of Acorn ADFS as well. It also has all the commands of the Acorn's 1770 DFS, plus the added features:

Added features include:

- Acorn ADFS compatible – Use ADFS on our DDFS board.
- Tube host Code – No longer any need to have the DNFS in your machine to use Co-Processors, even the CoPro and Master 512.
- Auto 40-80 Track sensing – no need to fuss with 40/80 track switches (even works with protected disks).
- An extremely powerful 8271 emulation – ensuring compatibility with almost all software.
- New low profile – small footprint board.
- Fits with all third party ROM boards.
- Option to double the speed of file handling operations – BPUT and BGET.
- Operates in both single and double density modes.
- OSGBPB has been recoded, increasing still further the speed of file handling.

Please note that not all DDFS's are capable of providing either the full 80% storage increase or of allowing a file the full size of the disk – Ours allows both of these!
If you already have a DDFS (any manufacturer), and wish to upgrade to our MkII version, then simply return your existing ROM and DDFS board and we will supply the new DDFS for only **£30.00**.

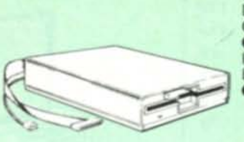
- Special introductory offer **£39.00**
- DDFS Manual (No VAT) **£6.95**
  - We will exchange your existing DFS Kit for our sophisticated DDFS for only **£25.00**

Please note, as the MkII DDFS is a hardware and software upgrade, it is not possible for existing Watford DDFS users to simply exchange their ROM for the new version.

## DUST COVERS (For our Disc Drives)

Single CLS (without PSU) **£3.20** Twin CLD (without PSU) **£3.85**
Single CS (with PSU) **£3.95** Twin CD (with PSU) **£3.90**

## Special 40/80 Disc Drive/DDFS Mk II Offer



- The popular 40/80 track 400K single Disc Drive, Double Sided, cased with Cables. Plugs directly to your Micro.
- Watford's extremely popular DDFS Disc Interface (allows 720K storage). Will run in both, Single & Double Density modes.
- A comprehensive User Friendly Manual.

A Bargain at Only **£123** (£7 carr)
(Offer valid while stocks last)

## 3½" DISC DRIVE OFFER

These top quality 3½" Double sided, 80 track, 1 Megabyte (unformatted each Disc Drives), are attractively finished in BBC beige. They are supplied complete with all cables and a Utilities Disc. They run directly from the BBC B/Master's own PSU.

| | |
|---|---|
| **CLS35 400K Unit** | **£69** |
| **CLD35 800K Unit** | **£126** |

## Mysteries of Disc Drives & DFS Revealed

Are you tired of faulty cassettes, and lengthy loading times? Do you want to upgrade your BBC micro to take discs but you get tied up in the plethora of jargon surrounding the choice and use of these systems.

Then The Mysteries of Disc Drives and DFS Revealed is the book for you. It explains in detail the different types of systems available, how they are installed and how to use them. Many examples are given including pre-written programs to call various functions of the DFS available only through Operating System calls. Different types of disc, 40/80 tracks etc. are all explained. This book is ideal for the beginner confused by the plethora of choice available in the marketplace.

**£5.95** (Book No VAT)

## DISC ALBUMS

Attractively finished in black leather look vinyl. Stores upto 20 Discs. Each disc can be seen through the clear view pocket.

**£4**

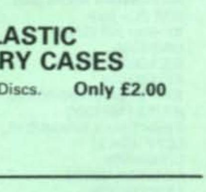
## FLOPPY HEAD CLEANER KIT

The heads in floppy drives are precision made and very sensitive to dirt. The use of a cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. It is very simple to use. Available in 3½" & 5¼", please specify.

**£4**

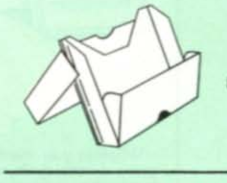
## ANTISTATIC LOCKABLE DISC STORAGE UNITS

Gives double protection – Strong plastic case that affords real protection to your discs. Antistatic helps avoid data corruption whilst in storage. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.



| | |
|---|---|
| **M35** - holds upto 50 5¼" discs | **£4.95** |
| **M85** – holds upto 95 5¼" discs | **£6.95** |
| **M25*** – holds upto 25 3½" Discs | **£4.95** |
| **M50** – holds 50 3½" Discs | **£6.50** |
| **M10** – holds upto 10 Data Cartridges | **£15** |

* Not lockable



## PLASTIC LIBRARY CASES

Holds up to 10 5¼" Discs. **Only £2.00**

## DISC PLONKER RACK

When using ones micro, there is a tendancy to have more than one Disc on the desk. This exposes them to the hazards of fingerprints, scratches, dust, coffee and an untidy desk.
Why not protect your valuable data from all these hazards with the help of our extremely handy and low cost DISC PLONKER RACK. It holds up to eight 5¼" Discs.

Protection at Only: **£2**

## Quality Disc Drives from Watford

*To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.*

*The first capacity given in the first column indicates capacity in single density mode. That within the brackets is the capacity in double density mode. All disc drive type numbers start with the prefix "C".*

*The tinting on some of the boxes is used to indicate which Drives are 40 track (non-tinted) and which are 80 track (tinted). All our 80 track drives are already fitted with a 40-80 select switch.*

***All our Disc Drives are Double Sided and will operate in both Single and Double Density modes.** Extensive experience of the usage of disc drives suggests that the JAPANESE drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.*

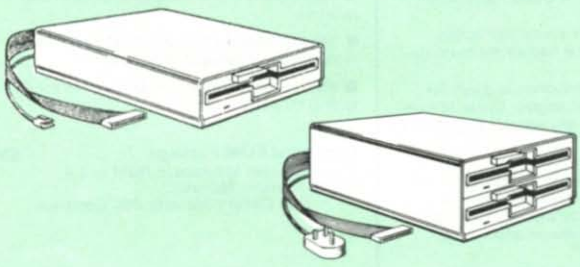
*Various UK "manufacturers" of disc drives for the BBC micro (more accurately, "packages" label other manufacturers drives with their own name). We buy the high quality NEC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.*

*If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.*

*Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate (extensive tests within our workshops have confirmed this). All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. Ideal for Schools & Colleges. We are now able to supply all single disc drives with Power Supply, in either single or dual case. (Dual case has a twin data cable and a power supply capable of driving two disc drives) allows easy expansion to a dual drive unit, at a later date. Prices stated in the pricing boxes below are for single drives in standard single cases. Single drives in a dual case cost an extra £10. (At Watford we anticipate your needs of tomorrow, not just today)!*

*When using a BBC Micro, most people find themselves short of desk space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space) your BBC, Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with Watford plinth. (Turn to the 5th page of our advert for the Plinths).*
*P.S. All our 5¼" Disc Drives with PSU are compatible with the Compact Micro. All you require is the special Compact Disc Drive Cables designed by us.*

### Our Disc Drives conform to BS415



### "Test Bureau Approved for Use in Education"

| Capacity | Drives without P.S.U. | | Drives with P.S.U. | |
|---|---|---|---|---|
| | Single | Twin | Single | Twin |
| 400K<br>(720K) | CLS400S<br>£79 | CLD 400<br>£168 | CS 400S<br>£89 | CD400<br>£188 |
| 800K<br>(1.44M) | | CLD 800S<br>£159 | | CD 800S<br>£179 |

- TWIN Disc Drive Case, complete with Power Supply & Cables **£43**

**Securicor carriage on Disc Drives £5 to £6**

*Prefix **C** = Cased Drive*
***L** = Less PSU*
***S** = Single*
***D** = Double*

*Suffix **S** = 40-80 Switchable*

*e.g. CLS400S = Cased Disc Drive, Less power supply unit, single 5¼" 400K, (720K in double density); Double sided; 40/80 track switchable.*

**Cable to connect 5¼" Disc Drives to BBC Compact**
**Single £9 Twin £12**
**Special Cable to connect both 3½" and 5¼" Disc Drives simultaneously to the BBC Compact £13**

## 3M – DISKETTES

*3M – SCOTCH Diskettes with Lifetime warranty from Watford Electronics your 3M Appointed Distributor.*

| | |
|---|---|
| ● *10 × 5¼" S/S D/D 40 Track Diskettes (744)* | ***£6.00*** |
| ● *10 × 5¼" D/S D/D 40 Track Diskettes (745)* | ***£7.00*** |
| ● *10 × 5¼" S/S D/D 80 Track Diskettes (746)* | ***£11.50*** |
| ● *10 × 5¼" D/S D/D 80 Track Diskettes (747)* | ***£11.00*** |
| ● *10 × 5¼" 1.6M D/S D/D High Density Discs for IBM XT and AT* | ***£16*** |
| ● *10 × 3½" S/S D/D 40/80 track Discs* | ***£10.00*** |
| ● *10 × 3½" D/S D/D 40/80 track Discs* | ***£11.75*** |
| ● *10 × 3½" High Density Diskettes* | ***£25*** |

## TOP QUALITY 3½" & 5¼" DISKETTES

To complement our range of Quality Discs and Disc Drives, WE are now supplying SPECIAL OFFER packs of 10 Lifetime guaranteed discs. Each disc has a reinforced hub ring. Supplied complete with selfstick labels and a Plastic Library Disc Box.

| | |
|---|---|
| ● *10 × **M3** 3½" D/S D/D 80 Track Discs* | ***£11*** |
| ● *10 × **M9** 3½" Double Side High Density* | ***£25*** |
| ● *10 × **M4** 5¼" S/S D/D 40 Track Discs* | ***£5*** |
| ● *10 × **M5** 5¼" D/S D/D 40 Track Discs* | ***£7*** |
| ● *10 × **M7** 5¼" D/S D/D 80 Track Discs* | ***£9*** |
| ● *10 × **M8** 5¼" D/S H/D Hi-Density Discs* | ***£14*** |
| ● *3" Double Sided Discs* | ***£2.50** each* |

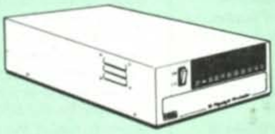
PRICES SLASHED

## Special BULK OFFER on 5¼" DISCS

(Supplied packed in Anti-Static Lockable Storage Units)
(Lifetime warranty on Discs)

### BULK PACK DISCS in lots of 100

| Type | S-S 40T | D-S 40T | D-S 80T |
|---|---|---|---|
| ● Without Sleeves | £35 | £39 | £45 |
| ● With Sleeves | £38 | £42 | £48 |



## WATFORD's WINCHESTER DRIVES

Undoubtedly the best value for money Winchester Hard disc available anywhere for the BBC Micro.

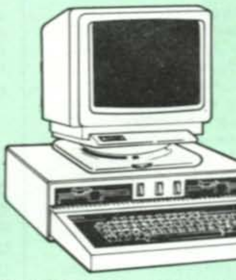
This 30 Megabyte hard disc is completely compatible with the Acorn ADFS – that's why we have bundled it with each Winchester drive, along with a Utilities Disc.

Finished in rugged metal and fetching BBC beige, the Winchester has an internal fan, so quiet you won't even hear it! A switched mode power supply and a neon-lit on/off switch are there along with a light on the hard disc to tell you when it is working – just compare the price with our competitors' 20 or 28 Mbyte discs!

Compatible with the Master, and the BBc B (with 17 X disc interface).

● 10 Megabyte **£350;** ● 30 Megabyte **£405**
(Securicor Carriage £9)

## CDP800S



## CDPM800S

Twin 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC Micro. Supplied complete with integral power supply, cables and Utilities disc. The mains switch with neon On/Off light indicator, and the two 40/80 track switches are mounted on the front panel for ease of use.

**CDP 800S for BBC Micro £182**
**CDPM 800S for Master £185**
**DP35-800 for BBC/Master £169**
(For DP35-800S spec. see Page 13 of our advert)

*(Securicor Carr. £7)*

(The above drive units are 2 Megabytes unformatted)

**Continued** ⟶

QUEST
MOUSE Mk II

## QUEST MOUSE MkII

*The ultimate in Mouse technology, the Watford Electronics Quest Mouse must be the most powerful Mouse package yet produced for the BBC Micro. Featuring state of the art 32K ROM software the Quest Mouse package is filled with features essential to the budding artist. The Quest Mouse is a high precision, low profile and large footprint mouse. It has three large comfortable buttons and its RUBBER COATED STEEL BALL is smooth and easy to use on virtually any work surface. This also eliminates any directional bias that one encounters on the most well-known mouse for the BBC. The Quest Mouse is FULLY HARDWARE COMPATIBLE with the AMX MOUSE so that it will work with any of the AMX range of software.*

*The two parts of the Quest package are available separately so that existing Mouse owners can upgrade to the Watford's sophisticated Quest Paint software or replace their existing worn out mice for a minimum cost.*

## QUEST PAINT

*The Quest Mouse software is supplied on a PALPROM unit to allow the sophisticated 32K program to be used from a single ROM socket. It is compatible with the BBC B, BBC B Plus and BBC Master Series machines.*

*The software is used to draw high resolution Mode 1 pictures in full colour. All menu selection and control of the drawing process is performed with the mouse so that you will hardly ever touch the keyboard.*

### SOFTWARE FEATURES

*The software is far too powerful for us to describe it fully in such a small space. Below is a list of the various features. Please write to us for a fully descriptive leaflet.*

*Disk interface not required. Utilities disk has facility to create and print big screens. Colours applied can be solid, either pattern of user defined pattern. Drawing can use brush or airbrush. Brush shapes can be defined and stored. Airbrush sprays colour/pattern randomly with four jet sizes and even or center spread. Colour cycles. Colour protection to stop particular colours from being overwritten by selected drawing actions. All standard drawing facilities like: rubber, straight pencil lines, triangles, circles, ellipses, rectangles, parallelograms, polygons, etc are provided. All shapes can be solid or just a boundary line. Once a shape has been set up it can be repeated anywhere on the screen. Global colour replace in a rectangle. Powerful fill facility for areas and vertical/horizontal lines. Full cut and paste of rectangular areas with rotation and size with screens from Watford Beeb Video digitiser. Load and Save screens with colour pallet information, save brush and pattern definitions etc.*

*Take The Guesswork Out of Selecting a Mouse Package*
*With reviews like this how can you go wrong.*

***Popular Computing Weekly, 9-11 June '87***
*"What you actually get for your money is a well built, three button mouse (far superior to the AMX mouse)."*

*"Overall the combination of a quality mouse and decent art package gives Watford Electronics a real chance of supplanting AMX as mouse supremos."*

**FREE**

With every QUEST MOUSE package purchased from us this month, we are giving away absolutely FREE our QUEST FONT DISC software pack.

***A&B Computing June '87***
*"... Watford Electronics, a company famed for excellent hardware add ons and versatile software packages. Called Quest mouse, "this is a very special mouse driven drawing package..."*

*"... you will have one of the most comfortable and professionally built mice I have used in a long time. The buttons are responsive, the mouse movement is smooth and without directional bias – a pleasure to use."*

*"What we have here is probably the best art package there is for the BBC Micro ..."*
*"Quest Paint is a major leap forward in BBC programming. .."*
*"Quest Paint is an original piece of programming, it is friendly and well endowed with many useful facilities. I would comfortably say it is easier to draw good pictures with Quest Paint than it is with more expensive 'Professional' art packages for the Atari ST and the Commodore Amiga. A recommended buy if you are looking for the best in BBC micro based art packages".*

***Acorn User, September '87***
*"The mouse (Quest) performs well in the face of competition from AMX, Wigmore and the rest ..."*
*"... this package represents excellent value for money. If you are interested in art then this program is for you to buy".*
*"All in all, Quest Paint is a very professional package. It contains virtually every feature the budding artist could require".*
*"What makes Quest Paint so versatile is the addition of a sub-menu which allows you extensive control over each function".*
*"Until recently, Superart from AMS had been judged as the definitive mode 1 graphics package for the BBC micro. But now it has a serious rival in the form of Quest Paint, from Watford".*
*"As a measure of what is contained within Quest Paint, I would say it had all the features of Superart plus ..."*
*"In most art packages, provision is given for drawing triangles and rectangles. Quest Mouse goes 14 better, allowing any regular polygon of upto 16 sides".*
*"One facility, not found on any other Art package to my knowledge, is the ability to access a digitiser from within the program".*
*The reviewer concludes by saying, "The result is an extremely comprehensive and professional art package".*

***John Kilby, Head of Computer Science, Bishop Wulstan High School, Rugby, writes:***
*"Quest has been an excellent piece of equipment. The problem that seems to occur everyday is that at lunchtime the pupils rush to the computer room to make sure that they are first in the queue for the 'Quest' mouse".*

***Beeblet User Group, New Zealand Oct '87:***
*"One of its nicer features is that the top menu is done in Mode 0, the drawing itself is in Mode 1. Thus on screen together are two different Modes. A neat way around an old problem".*

| | |
|---|---|
| Quest Mouse II & Quest Paint | **£58** |
| Quest Mouse II, Quest Paint, AMX Stop Press & Pagefont | **£89** |
| Quest Mouse II only | **£26** |
| Quest Paint Software only | **£34** |
| Quest Font Disc | **£15** |
| Quest Mouse Mat | **£3** |
| Part Exchange your unreliable AMX Mouse for a Quest Mouse for only | **£22** |
| GXR ROM for the BBC Micro | **£22** |

(P.S. Quest Paint is not compatible with BBC Compact)

N.B.
1. Quest Paint supplied complete with Software in a 32K ROM, Comprehensive User Guide and a Utility Disc.
2. Quest Font Disc has 22 text FONTS for use within Quest Mouse.

# ConQuest

Watford's Quest package is an extremely powerful and flexible drawing package, with very wide and unusual features. However, since its launch various suggestions for even more advanced & powerful facilities were received from the Quest users. ConQuest allows you these more advanced facilities, like, distortion of a cutout to any shape and a full font designer. If you also have a GXR ROM in your machine or you are using a BBC Master then ConQuest will take advantage of this to give ellipses at any angle, sectors and arcs, etc. Quest combined with ConQuest and Acornsoft GXR ROM make up THE MOST POWERFUL drawing packages available for the BBC range. Quest Paint is able to take advantage of almost any additions to your machine, such as Shadow or Sideways RAM. ConQuest takes this principal even further, by utilising the otherwise normally incompatible Sideways RAM facility by holding pictures in them.
Some of the features are:

- *Pick filenames off the screen for loading and saving.*
- *Rotate a cutout to any angle and Distort it to any four sided shape.*
- *Has Built in Font editor.*
- *Default brushes and patterns on startup.*
- *16 x 16 font available on start up.*
- *Ability to reset patterns, fonts and brushes to default at any time.*
- *ROM based enhanced Epson and compatible printer dump.*
- *ROM based enhanced extended picture routine.*
- *Ability to create and abort extended pictures.*
- *Improved disk access speed for extended pictures.*
- *User definable sideways RAM driver for incompatible sideways RAM systems.*
- *Ellipses at any angle on Master 128 (or B with GXR ROM).*

| | |
|---|---|
| **ConQuest ROM Package** | **£30** |

(Price includes software in ROM and a comprehensive Manual).
(Not Compatible with BBC Compact)

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## MARK II LIGHT PEN

*Our Mark II Light Pen is the very latest in light pen technology. It is totally insensitive to local lighting conditions and works with many different monitors. The pen only responds to the High Frequency light produced by your monitor/TV. An LED indicates when valid video data is being produced. A conveniently located switch is also fitted.*

***Price Only £21***

*(Price includes FREE software Disc and Operating Manual)*

# RB2 Marconi TRACKER BALL

| | |
|---|---|
| RB2 (AMX/Quest compatible) | £45 |
| RB2 including Quest Paint | £75 |

## FLEET STREET EDITOR

| | |
|---|---|
| Software pack for BBC Micro | £33 |
| Software pack for the Master | £39 |
| Software Pack for Compact | £40 |
| Admin Xtra Disc Utility | £13 |
| Walt Disney Disc Utility | £13 |
| Fonts N Graphics Disc Utility | £13 |

# *THE NEW Mk III AMX MOUSE*

**ONLY: £59** **Inc. Super Art package**

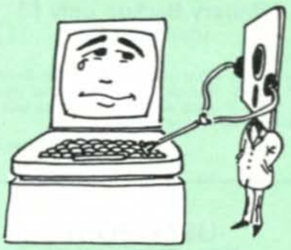
(carr £3)

*(Please specify for BBC, Master or Compact)*

FREE our popular Colour Art software pack worth £15 with every AMX Mouse package purchased from us.

| | |
|---|---|
| MOUSE MAT | £3 |
| AMX MOUSE ONLY | £29 |
| AMX UTILITY Package | £11 |
| AMX SUPERART Package | £34 |
| AMX STOP PRESS – A Desktop publising software. Works with Keyboard, Joystick or a mouse | £32 |
| PAGE-FONTS – Over 20 Fonts for use with AMX Pagemaker | £12 |
| AMX DESIGN (ROM) | £55 |
| AMX XAM Educational | £15 |
| AMX EXTRA EXTRA | £16 |
| AMX MAX A gem of desktop (ROM) | £15 |

## DIAGNOSTICS DISC



The BBC Micro is a very complex machine and thus diagnosing a fault can be very difficult.
At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.
The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:
RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.
This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

**Only £20.00**

# *BEEB* VIDEO DIGITISER

**"Test Bureau Approved for Use in Education"**

Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro.

This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket.

Images produced can be compressed, stored to disc, printed on an Epson compatible printer, directly used to generate graphics, analysed for scientific and educational use or converted to other formats e.g. Slow Scan TV or receiving a picture from a remote camera using a modem.

The output from the digitiser exactly matches the graphics capability in each mode, with up to 8 levels of grey in mode 2. The unit connects into the User Port and automatically scans a complete picture in 1.6 seconds.

Both the black and white levels can be adjusted manually for the optimum picture, or switched to automatic for unattended use. The image produced can be reversed if necessary.

Full controlling software is supplied on a normal sideways ROM and this is easily accessed via additional * commands. The package i designed to allow easy input of complex screens and give full access of the data to the user. Once on the screen, the image can be used as a normal graphics screen, allowing any of the usual graphics commands in BASIC or other ROMs to work on it.

A special print dump routine is included with the driver programs. This is specially designed to produce a fast, correctly proportioned picture, with reduced "contouring", resulting in an accurate reproduction of the original image.

Detailed examples of driving this unit from BASIC or other languages are all provided in the extensive manual supplied.

**£109** (Carr. £5)

(Price includes) Digitiser Unit, Software in ROM & a Comprehensive Manual)
(BBC B+ and Master compatible, except Master with Econet)

# *Magazine Maker*

(As seen on TV)

A combination of the Pagemaker and Watford's Beeb Video Digitiser.

Using any video that provides a composite signal and the digitiser, images from a camera or TV can be converted into a graphics screen on the BBC Micro.

They can then be used within Stop Press to illustrate magazines or newsletters – in fact anything that needs to be created on A4 size paper.

With Stop Press's many features, a variety of pictures can be composed – the only limit being the imagination.

Pictures can be doctored using Stop Press's graphics option to produce any number of effects.

Text can be formatted around the digitised photo on screen using the facilities available, which include 16 typefaces, character and pattern definer, text formatting and the ability to load in wordwise and viewfiles plus much more.

Once created the picture can be printed out.

The Magazine Maker is suitable for any use that requires illustrated documents.

Complete Package **£135.00** (carr. £3)

WAPPING EDITOR
"MIGHTIER THAN THE QUILL"

Watford Electronics bring professional quality Desktop Publishing to the Beeb. The Wapping Editor is a totally self contained mouse-driven desktop publishing package designed to run on the BBC B, B+ and Master computers. The massive 64K Rom contains ALL the software you need to do your own publishing. It 'Brings the Freedom of Press' to your fingertip. The software has a word processor, a graphics package, a page layout section and a font designer. Although very sophisticated, Wapping Editor is simplicity itself to use. Anyone already familiar with Quest Paint will immediately feel at home.

## GRAPHICS PACKAGE

Imagine Quest Paint re-written to take advantage of the high resolution of Mode 0, well this is it. The Wapping Editor could well be worth buying for this facility alone. This must surely be the graphics.

## WORD PROCESSOR

This section is a fully functional word processor specially tailored to suit the Desktop Publishing environment. Gone are all the unnecessary and cumbersome text formatting commands – these are dealt with in the 'Page-Layout' section. The features of this word processor include wordwrap, wordcount, insert/overwrite, move block, copy block, delete block, search and replace, browse, etc, many of these features being mouse controlled. Text input can of course be taken from existing word processor files like Wordwise, View, etc, but it is not necessary to have a separate word processor in order to use this package.

## PAGE-LAYOUT SECTION

Page Layout becomes easy using these mouse-driven routines. The user simply 'pulls' a rectangle onto the page and states which text document or graphic is required to fill the space – it's as simple as that! Text can be automatically printed in a pre-set number of columns, left justified and/or right justified, or centered. Several different typefaces can be held in memory at one time. Graphics may be stretched, squahsed or cropped to fit any size rectangle. Graphics input can be from the software provided in the package or, using the 'mode convert', from any graphics mode screen.

## THE FONT EDITOR

This is an enhanced version of the font editor contained in the Con-Quest ROM and allows the editing of ALL 95 characters. As well as being able to design your own typefaces, fonts from other DTP packages or from Quest Pain may be loaded into the editor and converted for use with the Wapping Editor. This sophisticated editor has numerous functions including slide, flip, invert and rotate individual characters or the whole font. Individual characters can be mirrored or copied and a mask feature allows you to superimpose two characters. Lines and columns can be inserted or deleted allowing the character to be stretched or squashed. This font editor will also allow 'font' and 'brush' files to be designed for use with Quest Paint.
This package is the latest in the line of integrated professional quality mouse-driven software from Watford Electronics, the company that adds power to Beeb.

| | |
|---|---|
| Wapping Editor | Launch Offer: **£69** |
| Wapping Editor with Quest Mouse | **£89** |

**Continued** →

# ARIES CORNER

## B-32 Shadow RAM Card

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Comal, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus, Interword and many other applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved *FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as the printer buffer) or to load tape programs into a disc system.

The B32 simply plugs into the 6502 processor socket on your BBC micro – no flying leads to connect and no soldering. Provision of the on-board ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

- Recommended by Computer Concepts for use with their Inter series of ROMs.

Price: **£80** (carr. £2)

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## Aries B-12 Sideways ROM Board

This board is extremely well made, simple to install, reliable when fully loaded and compatible with the Aries-B20 and the Aries-B32

The B12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on the board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

The B12 system consists of two parts: a large detachable "mother board" which carries the extension ROM sockets and a small "base board" on a short ribbon cable, which plugs into the existing sideways ROM sockets. This two-board design eliminates the reliability problems previously associated with some other ribbon-cable based systems.

If you do not have a B32 or B20, a small adaptor module (the Aries-B12C) is available at a nominal cost.

| Price: | | |
|---|---|---|
| Price: | Aries B-12 | £40 |
| | Aries B-12C | £5 |

**CREDIT CARD 24 HOUR**
**Ansaphone Hot Lines**
**(0923) 50234 or 33383**

## ARIES B-488 IEEE-488 INTERFACE UNIT

The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB' or 'HP-IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

**£238** (Carr £3)

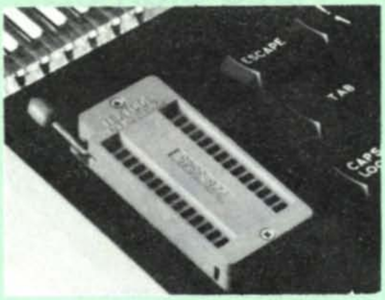
---

## EXTERNAL ROM BOARD for BBC MASTER

This external Beige finished, free standing cased unit with its own Power Supply allows you to plug-in upto 12 ROMs and 16K Sideways RAM.

Only £78

## SIDEWAYS ZIF SOCKET



Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

- Very simple to install. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.

- The low profile of the socket allows unrestricted access to the Keyboard.

- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.

- This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for all professionals and Hobbyists alike.)

- BBC, B+ and Master compatible.

ONLY **£18** (carr £3)

---

## Low Profile CARTRIDGE SYSTEM

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack for the BBC B.

| | |
|---|---|
| ● Complete System | £11 |
| ● Spare Cartridges | £2.50 |
| ● Spare Rack | £1.50 |

**ROM Cartridges for the BBC Master**
Twin **£8**; Quad **£12**

## 16K DISC RAM

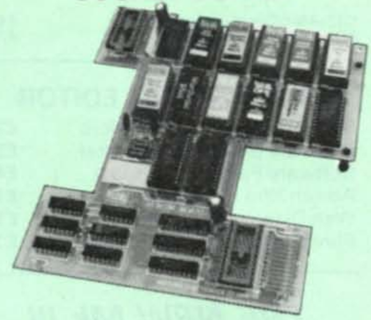
Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.
Key points to note about this new addition to the Watford range of products are:

- Write protection (useful in a variety of circumstances).
- Compact construction.
- Supplied complete with Battery Backup.
- No overheating or overloading problems.
- Free utilities disc supplied.
- Can be used as a 16K PRINTER BUFFER.
- Ideal for professional software development.
- Supplied with utilities software disc.

Only: **£35** (carr £2)

P.S. 16K Disc Ram Board is not designed to work in conjunction with a Sideways ROM Board.

## SOLDERLESS SIDEWAYS ROM SOCKET BOARD



In the May 1986 Micro User's independent review, the writer concludes, "The board has been well laid out. Its position is much better than others – not over the HOT RAM chips and further away from the disc controller area". "I give the solderless ROM board the thumbs up and wish it success".

This brand new board from Watford Electronics is designed specifically for those wishing to add a ROM board to their own BBC without the need to perform any soldering.

This new board expands the total possible number of ROMs in a BBC from 4 to 16.

Unlike our competitors inferior boards, the ONLY upgrade required for fitting battery backup to the Watford Solderless ROM board (all Watford ROM boards, actually) is the fitting of the battery itself. (No other expensive components are required.)

- The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:
- Increase your BBCs capacity for ROMs from 4 to 16.
- **No soldering required.**
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 takes two 6264 RAM chips.
- Read protect to make RAM "Vanish") allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

**Price: Only £32**
Battery backup fitted **£36**
Battery Backup only **£3**
(carriage £2)

- Sideways RAM Utilities Disc for Solderless ROM Board. Includes the options to load and save ROM Images and the facility to use Sideways RAM as Printer Buffer.

**Only: £8**

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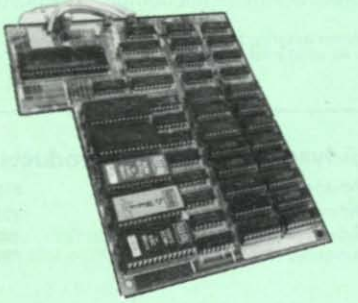
## USER PORT SPLITTER UNIT

User Port Splitter
A
B

Gone are the days when you had to plug and unplug devices from the User Port. This extremely useful little device allows two units to be connected to the User Port simultaniously, and select between them simply by toggling a switch. This device is particularly useful for those people using Quest Mouse and the Watford Video Digitiser or any similar combination.

Excellent Value at **£22** (carr £2)

## ROM/RAM CARD



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 3 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO overheating problems.
- No User Port corruption (avoids problems with the mouse, modems, Eprom Programmers, etc.)
- Fully buffered for peace of mind.
- Firm mounting in BBC micro.
- Compatible with all BBC micros (not BBC+ or Master).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of Battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- Accepts any ROM.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE Fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROM-SPELL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM-RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM-RAM Board.

The ROM-RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, for later.

Please write in for further details.

### *INTRODUCTORY PRICES:*

- ROM/RAM card with 32k dynamic RAM ...... ***£48***
- ROM/RAM card with 64k dynamic RAM ...... ***£65***
- ROM/RAM card with a massive 128k dynamic RAM ...... **£109**

(carriage on ROM-RAM Card £3)

### *OPTIONAL EXTRAS:*

- 16k plug-in Static RAM kit ...... **£17**
- 16k Dynamic RAM for Upgrade ...... **£17.50**
- Battery backup ...... **£3**
- Read and Write protect switches ...... **£2** each

Complete ROM-RAM board
All options installed ...... **£115**

**P.S.**
**Is your existing ROM Board overflowing with ROMs? Do you need more Sideways RAM? Is your Board unreliable? Then upgrade to Watford ROM/RAM Board and pay £5 less**

## *Le Modem*

### The MODEM from Watford

*The features that make Le MODEM such good value are:*

- *Auto Dials, Auto answers, and is completely controlled by your micro. There are no external controls!*
- *Allows you to access PRESTEL, B.T. GOLD, THE SOURCE, MICROLINK, MICRONET, MICROWEB, THE TIMES NETWORK, MICRO LIVE (BBC TV database), CITY BB and more.*
- *Supplied with a comprehensive telecomms package in a 16K sideways ROM which includes a FULL PRESTEL terminal allowing TELE-SOFTWARE to be downloaded.*
- *A comprehensive 80 column terminal. This includes XMODEM error checked transfer protocol, to allow error free data transfer anywhere in the world!*
- *FULLY controlled by simple "*COMMANDS allowing you to control it from your own BASIC programs. To get you started we supply a FREE disc of bundled software!*
- *Connects to the 1MHz bus. A *AUDIO ON-OFF command allows you to actually hear the telephone line through your BBC micro loudspeaker.*
- *Completely self contained with internal mains power supply. (Even a free mains plug is fitted!) A *TEST facility gives ON SCREEN indication that Le MODEM is working correctly.*
- ***FREE Registration to MicroLink.***

### SALE OFFER £62 (carr £5)

(Price includes, Le Modem, Software ROM, Cables & Comprehensive Manual)
(Write in for further details)

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## *APOLLO*

### The NEW Modem from Watford

Following numerous requests from you, our discerning customers for an APPROVED, Low Cost & High Performance modem with Auto Dial & Auto Answer facilities as standard) we bring you the versatile APOLLO Modem. Just compare the features and look at the price (which incidentally includes the cost of the Software, manual and BBC connecting cable). We are sure you will agree that Watford Electronics in their traditional way are giving you a super 'value for money' deal.

Just look at these features:

- V21 for Bulletin boards, Microlink, Telecom Gold, etc.
- V23 for Prestel, Home Banking, and other Viewdata services.
- Reverse V23 allows User run Viewdata service.
- 1200-1200 half duplex for communications.
- XMODEM, HEX and ASCII file transmission.
- Auto Dial of given 'phone number.
- Auto Answer for User's Bulletin Board.
- 80 column terminal with split screen facility.
- Prestel text screen dump.
- Fully BABT approved.
- **FREE Registration to MicroLink.**
- **£6.50 off annual Membership to Micronet, Prestel and Telecom Gold.**

Sale Offer: **£64** **(Carr £5)**
Price includes, the Modem, Comm Software Cables & Operating Manual).
(Write in for full specification)

NEW

## Aries 1200 MODEM

### *If you thought £150 didn't buy much of a modem you haven't heard about the aries 1200*

Up till now buying a modem was a compromise between price and performance, but the new Aries 1200 offers performance and features not found on modems costing two or three times as much. Look at the features offered by the Aries 1200, features which you wouldn't expect from a modem at this price – and some which you would be lucky to find on a modem at any price.

- Operates in V21 (300/300), V23 (1200/75 and 75/1200) and proprietary V23 1200 mode.
- Connect it to any type of computer or terminal via the 25 way serial D connector or the BBC standard 5 pin Domino socket.
- A built in phone socket means your phone plugs straight through.
- A reset switch so the hardware makes it easy to restart – even when your software doesn't.
- Industry standard Hayes (C) compatibility means that this is one of the easiest modems to use. It can automatically work out the speed your computer is working at, and even the speed and protocol of the modem at the other end.
- Auto Call mode can dial using tone or pulse (the modem works that out too), and when it connects it will automatically determine the speed of the answering modem.
- Auto answer mode means the modem can be left unattended to answer calls from other modems, and of course it automatically works out the speed and protocol of the calling modem.
- The built in speaker and front panel LED's mean that you always know what the modem is doing.

. . . Features at any price.

- Proprietary V23 mode mean that two Aries 1200's can communicate at 1200/1200 and in this situation you can take advantage of the built in data compaction which reduces the volume of text you send by 30%.
- Built in scrambler means that data transferred between two Aries modems is automatically encrypted. The encryption code can be user defined for a totally private email system.
- User defined control commands means that the Aries can even be used from a dumb terminal or with non standard software.
- Front panel light include indicators for Power, Auto Answer Mode, Transmit, Receive, On line, Terminal ready and Carrier Detect. There's even an indicator to show the quality of the phone line.
- Internal watch-dog monitors the modems activity and in the event of a power failure or computer crash it automatically resets the modem. The Aries modem can never hold open your phone line or lock up your computer.
- Built in printer port allows the Aries to direct incoming data directly to a printer, text can be tagged so that it is selectively sent either to the printer or the computer.
- All modem setting are stored in solid state non volatile memory – no battery to go flat and hang crash the system.

Launch Offer **Only: £149**

Hayes Compatible BBC Comms Software ROM & Manual **£25**

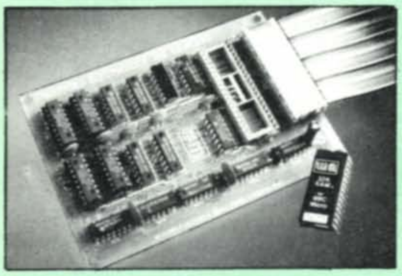
**WATFORD CUT PRICES NOT PERFORMANCE**

**Continued** →

# 32K

## SHADOW RAM-Printer Buffer

### Expansion Board



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Don't throw away your BBC B for a BBC B Plus or BBC Master. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16K or even 20K, but a massive 32K of extra RAM!!!

● IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer – type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.

● "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28,000 bytes free – 5 times as much as normal.

● In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24K of text in memory. This product is recommended as an ideal complement by Computer Concepts.

● Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20K of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28K of program space.

● Use the FULL 32K or the bottom 12K of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS423 etc. Print large text files while running long graphics programs, and have all your buffer options available as well (*FX15,21,138,145,ADVAL etc). Please note only a 12K printer buffer can be used with Wordwise or Wordwise-Plus, due to the way they are written.

● Unique facility to turn ROMs off and on again. Unlike all other ROM managers, this feature does not use 'unofficial' memory. Two bytes of normally user-inaccessible memory on the RAM card are used to ensure ROMs are disabled WHERE OTHER ROMS FAIL.

● Recommended by Computer Concepts for use with their Inter series of ROMs.

**Only £59** (carr £2)

(Price includes a comprehensive manual and the ROM)

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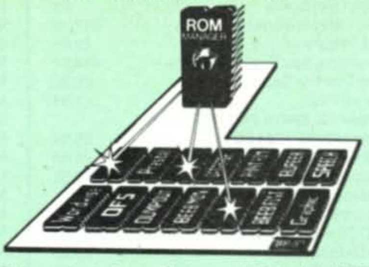
### INCREDIBLE WORDPROCESSING DEAL

Watford's 32K SHADOW RAM CARD and Computer Concept's INTERWORD Wordprocessor package.

at Only **£89** (carr £2)

## ROM MANAGER



Take control of your Sideways ROMs with ROM Manager. This powerful utility ROM gives you power over your sideways ROMs. Disable whole ROMs, send commands directly to named ROMs and many other powerful facilities.

*"Provides comprehensive management of all your installed ROMs".* (BEEBUG November '84.)

**ONLY £20**

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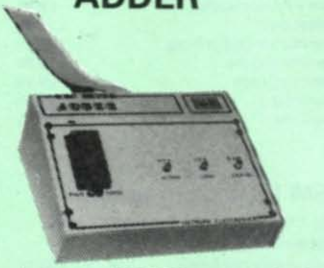
## ADDER



The only low cost EPROM Programmer for the BBC Micro that will program both the standard 21V and the new 12V5, 27128 EPROMS.

Adder is the ultimate EPROM programmer for the BBC Micro. It will program many different EPROMs up to the very latest 27256 32K devices.

The Adder unit connects to the User Port and draws its power from there too. The EPROM is mounted in a top quality ZIF socket. There are no switches or controls as Adder is entirely software controlled.

The Adder software provides sophisticated facilities for programming EPROMs from a RAM image produced by loading disc files. The software is menu driven and designed for ease of use.

Features:

● Two ultra fast programming algorithms or standard slow algorithm.

● Supports standard 21V programming and newer 12.5 volt EPROMs. (Software switched).

● The RAM image to be programmed can be built up in many ways. Sections of image can be loaded separately. Part programming. Read EPROM. Edit data in memory.

● Automatic processing to handle a list of files to program into the EPROM.

● Automatic disc buffering to allow programming of 32K 27256 devices from a 32K file without extra effort.

● Verification gives detailed error list and checksums are maintained. There is also a blank check facility.

● Works with all standard filing systems. Generates header code for RFS ROMs to allow Basic programs etc. to be stored in EPROM. More than one file per ROM permitted.

● Programs the following EPROMs:
From 2K to 32K: 2516, 2716, 2532, 2732, 2764, 2764A, 27128, 27128A, 27256 (Both 12.5V and 21V).

**£72** (£5 Carr)

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## TEX EPROM ERASERS

EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs! The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast. We use these erasers for all our own erasing work.

| | |
|---|---|
| ● **ERASER EB** – Standard version erases up to 16 chips. | **£28** (carr £2) |
| ● **ERASER GT** – Deluxe version erases up to 18 chips. Has automatic safety cut-off to switch off the UV lamp when opened. | **£30** (carr £2) |
| ● Spare UV tubes. | **£9** |

## *OFFICE MASTER*

**CASHBOOK** – A complete "Stand Alone" accounting software package for the cash based sole trader/partnership business. It is designed to replace your existing cashbook system and will provide you with a computerised system complete to trail balance.

**FINAL ACCOUNTS** – Will take data prepared by the Cashbook module and produce a complete set of accounts as following: Trial Balance with inbuilt rounding routine; Notes to the accounts; VAT Summary; Profit & Loss A/C; Balance Sheet.

**MAILIST** – A very versatile program. Enables you to keep records of names and addresses and then print, examine, sort and find them, all with special selection techniques.

**EASILEDGER** – A management aid software tool designed to run alongside an existing accounting system. Essentially a Debit/Credit ledger system which can handle sales, purchase and nominal ledger routines to provide instant management information.

**INVOICES & STATEMENTS** – Greatly reduces the time and cost of preparing Invoices and Statements by storing essential information like customer names, addresses and account numbers. Has VAT routines and footer messages facility.

**STOCK CONTROL** – Allows you to enter stock received, stock out, summary of stock items and current holdings together with details of total cost, total stock to minimum level, units in stock ordering, quantity and supplier detail.

All this for only **£21** (Disc)

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## *OFFICE MATE*

● DATABASE
● BEEBCALC SPREADSHEET
● BEEBPLOT GRAPHICS

**DATABASE** – Set up a computerised card index system with powerful search facilities.

**SPREADSHEET** – Offers many calculation and editing features.

**BEEBPLOT** – Provides visual representation from Spreadsheet data.

**OFFICE MATE Only £10** (Disc)

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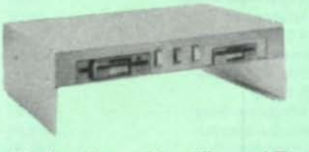
## Disc Drives DP35-800S



A Double disc drive – with a difference! Times are changing fast for the floppy disk, and whilst the current standard for the BBC B and Master Series is the 5.25 inch disk, the standard for the future will most certainly be the smaller; faster and more reliable 3.5 inch disks – now a standard feature of both the Master Compact and the Archimedes Series.

To support the present disc drive users, and cope with the future, we have designed our own plinth-mounted disk system – called the DP35 800S, it contains both the 5.25 inch and the 3.5 inch drive formats as well as offer a firm and rigid support for a monitor on top. With the BBC Micro underneath, the plinth makes a surprisingly small footprint on the desk – leaving you more space to work with.

The 5.25" disc drive is 40/80 track switchable. For ease of access, the switches are front mounted. DP35-800S has its own power supply, independent of the BBC Micro.

Watford's new plinth enables users to read, write and format disks both in DFS and ADFS format – currently the accepted standard for the Master Compact and the Archimedes, it also enables the user to read disks written for the Archimedes. Ideal for both BBC & Master.

Launch Offer: **£165** (carr. £7)

Continued ⟶

## BOOKS (No VAT on Books)

| | |
|---|---|
| 15 Hr Wordprocessing BBC/View | £5.95 |
| 15 Hr Wordprocessing BBC/WW & WW+ | £5.95 |
| 30 Hour BASIC (BBC Micro) | £12.95 |
| 6502 Assembly Language Programming | £19.95 |
| 6502 Application | £13.95 |
| 6502 Development Package | £7.50 |
| 6502 Programming the | £16.95 |
| 6502 Reference Guide | £10.95 |
| 68000 Assembly Language | £15.95 |
| 68000 Assembly Language Prog. | £10.95 |
| 68000 Assembly Language Techniques | £24.95 |
| 68000 Machine Code Programming | £13.00 |
| 68000 Microprocessor Handbook | £14.95 |
| 68000 Programming the | £22.95 |
| 68000 User Guide | £8.95 |
| 6809, Programming the | £18.95 |
| Advanced Disc User Guide | £18.95 |
| Advanced Prog. Guide to BBC | £9.95 |
| Adv. Sideways RAM User Guide | £9.95 |
| **Advanced User Guide for BBC** | £10.95 |
| Amiga Hardware Ref Manual | £23.70 |
| Amiga Machine Lang. Guide | £19.95 |
| ARM Assembly Lang. Prog. Manua | £12 |
| Art of Microcomputer Graphics | £16.95 |
| Assembly Language Prog. for the BBC | £9.95 |
| AY-3-8910 Programmable Sound Generator Data Manual | £3 |
| BASIC 2–User Guide | £2 |
| BBC–Advanced Graphics with the | £11.75 |
| BBC – Advanced Programming Techniques for | £8.95 |
| BBC–Mastering Assembly Code | £8.95 |
| BBC Micro & the small Business | £5.75 |
| BBC Micro Basic Sound & Graphics | £7.95 |
| BBC Micro–File Handling On | £8.50 |
| BBC Micro Programs in BASIC | £5.95 |
| BBC Micro ROM Book | £10.95 |
| BBC Micro–within the | £13.95 |
| BBC Master 128 for High Flyer | £10.95 |
| BCPL User Guide | £14 |
| BCPL The Language & its Compiler | £8.50 |
| C Big Red Book of | £7.50 |
| C - A Dabhand Guide to | £14.95 |
| 'C' Introducing | £9.95 |
| C for Programmers | £9.95 |
| C Programming Lang. | £23.95 |
| COMAL–Introduction to | £9.50 |
| Complete FORTH | £6.95 |
| Computer Graphics & CAD fundamentals | £9.95 |
| Deutsch Direkti (Book only) | £5.95 |
| DNFS Instruction Booklet | £2 |
| Disc Drive Projects for Micros | £6.50 |
| **DISC FILING SYSTEM (DFS) Operating Manual for BBC** | £6.95 |
| File Handling on BBC Micro | £8.50 |
| FORTH–Advanced | £9.95 |
| FORTH–A Text Reference | £19.10 |
| FORTH–Introduction to | £8.95 |
| FORTH on the BBC Micro | £9.95 |
| FORTH–Starting | £20.85 |
| Hackers Handbook - New | £6.95 |
| Hitch-Hikers Guide to A.I. | £8.95 |
| Interfacing and Robotics | £15.95 |
| Introduction to COMAL | £9.50 |
| Introduction to FORTH | £8.95 |
| Introduction to LOGO | £6.95 |
| Introduction to PASCAL | £17.95 |
| Inside Information, Computers & Coms. | £9.95 |
| ISO-PASCAL Reference Manual | £9.95 |
| LISP 2nd Edition | £15.95 |
| LISP Looking At | £11.95 |
| LISP the Language of Artificial Intelligence | £13.95 |
| Logo on the BBC Micro | £7.50 |
| LOGO–Introduction to | £6.95 |
| **Mysteries of DISC DRIVES and DFS REVEALED** | **£5.95** |
| Mastering Assembly Code | £8.95 |
| Mastering CP-M | £17.95 |
| Mastering Interpreters & Compilers | £14.95 |
| Mastering Music | £6.95 |
| Mastering the Disc Drive | £7.95 |
| Master Operating System | £12.95 |
| Master Reference Manual Part 1 | £14.00 |
| Master Reference Manual Part 2 | £14.00 |
| Master Reference Manual–Advanced | £19 |
| Mathematical Prog. in BBC Basic | £7.95 |
| Micro Prolog | £10.00 |
| Microtext for the BBC | £10.00 |
| Microtext Plus Manual | £9.95 |
| Microtext User Guide | £5 |
| PASCAL–Introduction to | £17.95 |
| PASCAL Programming | £9.45 |
| Pick Operating Sys. Practical Guide | £14.95 |
| Practical Disc File Techniques | £5.95 |
| Structured Basic | £7.95 |
| **The Epson FX-KAGA PRINTER Commands REVEALED** | **£5.95** |
| The Software Business | £5.50 |
| Towers Int. Transistor Selectors | £14.95 |
| Understanding Interword – A Beginners Guide | £6.50 |
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| Mastering View, Viewsheet & Viewstore | £12.95 |
| VIEW Dabhand Guide | £12.95 |
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| 1-2-3 For Business 2nd Edition | £20.95 |
| 1-2-3 Command Language | £19.95 |
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| 8086/8088 Assembly Language Prog. | £11.95 |
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| Amstrad PC1512-1640 Step by Step – Using | £8.50 |
| Art and Desktop Publishing | £18.45 |
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| CP-M Plus Handbook | £13.95 |
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| Local Area Networks 2nd Generation | £19.95 |
| Lotus 1-2-3 Desktop Companion Soft/B | £24.95 |
| Lotus 1-2-3–Illustrated | £18.45 |
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| Microcomputer CAD Manual | £25.95 |
| MS-DOS–ABC on | 17.95 |
| MS-DOS Advanced Programming | £19.95 |
| MS-DOS Advances (Microsoft) | £19.95 |
| MS-DOS Handbook 3rd Edition | £18.95 |
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It features information about:

- Memory Organisation
- Slow data bus
- Detailed circuit description
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- 1 Mhz Bus
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- Second processors – Internal, Z80 and 80186
- Disc Filing Systems
- ANFS
- Terminal Emulator & Editor
- View internal format
- Detailed differences between Model B, B+, Master 128K and Compact
- Comprehensive appendix on 65C12 instruction set

At the rear of the manual there are pull out circuit diagrams for the Master 128K.
A worth-while addition to any Master owner's library.

**All this for just £17 (NO VAT)**

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**HARDWARE** – How to design your own work station. Hardware additions (disc drives, ROMs, printers, 2nd processors, etc). DIY alterations.

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**GETTING ORGANISED** – so that you keep track of your programs and control of your software. Setting up for easier programming sessions.

**NEAT PROGRAMMING** – Good style. Writing structured programs. Getting the best from BBC-BASIC, Graphics and screen displays. Speeding up programs. Saving space.

**GENERAL PROGRAMMING TIPS AND HINTS** – with a multitude of examples (eg input vetting, dealing with dates, blanking out function key messages, error trapping, disabling ESCAPE and BREAK, use of EOR with colour, etc).

**DEBUGGING** – Specific errors and how to handle them. How to test programs fully.

**STANDARD PROGRAMS** – Assessing word-processors, spread-sheets, databases, graphics packages, communications etc. How to customise them to your own requirements.

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Ideal for cleaning and preventing static build-up on TV/Monitor Screens.

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This simple to use aerosol spray is ideal for removing Dust and Dirt deposits from the Keyboards and similar inaccessible places. **£3**

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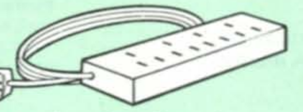

4 way top quality mains trailing sockets. Supplied wired up with mains plug ready for use. Can be screwed to floor or wall if required. Very useful for tidying up all the mains leads from your peripherals.

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Increase the speed of your Disc Drives by soldering this switch to your BBC B or B+ Keyboard.

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Convert two single Disc Drives into one Dual Drive with this simple external unit (Suitable for Disc Drives with PSU. For Disc Drives without PSU, you will also require Watford Power Duck, see below).

**£14**

**Watford POWER DUCK £8**

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(All ready made and tested)

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|---|---|
| CASSETTE LEADS 7 pin DIN Plug | |
| to 5 pin DIN Plug + 1 Jack Plug | £2.00 |
| to 3 pin DIN Plug + 1 Jack Plug | £2.00 |
| to 7 pin DIN Plug | £2.50 |
| to 3 Jack Plugs | £2.00 |
| **6 pin DIN to 6 pin DIN Plug (RGB)** | £2.50 |

**DISC DRIVE POWER LEADS**

Supply from BBC power supply to standard Disc Drive connector.
Single **£3.00** Dual **£3.75**

**DISC DRIVE INTERFACE LEADS**

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| RGB (6 PIN DIN) | 30p | 45p |
| RS423 (5 pin Domino) | 40p | 50p |
| Cassette (7 pin DIN) | 25p | 65p |
| ECONET (5 pin DIN) | 20p | 30p |
| Paddles (15 pin 'D') | 80p | 200p |
| Disc Drive Plug 4 way | 75p | – |
| 6 way Power Connector | 80p | 95p |

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| DS3691 | £4.50 |
| DS88LS120 | £5.25 |
| LM324 | £0.45 |
| SN76489 | £5.50 |
| SAA5050 | £8.75 |
| UPD7002 | £6.00 |
| WD1770 | £12.00 |
| 2764-250nS | £2.80 |
| 27128-250nS (12V5) | £3.25 |
| 27128-250nS (21V) | £5.25 |
| 27256-15 | £5.00 |
| 27512 | £9.00 |
| 27C101G (1 Meg) | £17.50 |
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| 4020 | £0.90 |
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| 62256ALS-15 | £12.50 |
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| 6845SP | £6.00 |
| 68B50 | £2.95 |
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| 74LS04 | 25p |
| 74LS10 | 25p |
| 74LS123 | 80p |
| 74LS163 | 70p |
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| 75453 | 70p |
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| ACORN ADFS | £25 |
| ACORN BASIC 2 plus User Guide | £22 |
| Acorn BCPL | £42 |
| Acorn COMAL | £38 |
| ACORN DNFS | £17 |
| Acorn FORTH | £32 |
| Acorn Graphics | £25 |
| Acornsoft C | £52 |
| Acorn LISP | £19 |
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| Communicator | £49 |
| Commstar II | £28 |
| EPSON NLQ ROM | £25 |
| Graphics Extension Rom | |
| GXR-B | £21 |
| GXR-B+ | £22 |
| Help II | £27 |
| ISO Pascal | £51 |
| ISO-Pascal Stand Alone Generator | £30 |
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| Microtext Disc | £46 |
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Also provided are window setting utilities and OSWORD calls to plot and read Mode 7 graphics pixels.

Facilities:

- Vertical and horizontal scaling in all graphics modes and mode 7
- Rotation of image by 90, 180 or 270 degrees
- Left hand margin setting
- Screen dump window setting
- Colours appear as grey scale
- Two tone fast dump
- Colour mask
- Mode 7 contrast expansion
- Mode 7 contiguous dump
- Key triggered and User Port triggered dumps

*The Micro User Feb. 1985.*
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For use with the following printers:
GLP, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, M1009, NEC PC8023, DMP100/200/400, Panasonic KX1081/82, Mannesman Tally and compatibles.

**Only: £25**

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**Specification:**

- 16 Bit Intel 8088-2 or NEC V20 78108 microprocessor, running at 8MHz or 4.77MHz. (3 times faster than IBM PC/XT).
- 8087-2 maths co-processor, optional.
- 640K minimum expandable to 1024K on system board, extra 384K RAMDISK available.
- 360K Single Floppy (optional 2nd Floppy/3.5"/20MB Winny/T. Streamer).
- CLOCK on System board, gives non stop DATE & TIME.
- 8 expansion slots.
- 102 keys keyboard.
- RS232 with two ports.
- 150W power supply.
- Microsoft MS DOS 3.30.
- GW-BASIC 3.21.
- Mono graphics/parallel card.
- Legal BIOS and built in games port and clock.
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- Optional 80287 Maths co-processor
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- 102 key keyboard.
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- HDD/FDD Card.
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- GW-BASIC 3.21.
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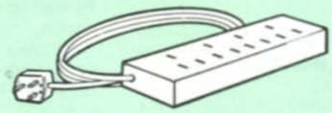

4 way top quality mains trailing sockets. Supplied wired up with mains plug ready for use. Can be screwed to floor or wall if required. Very useful for tidying up all the mains leads from your peripherals.

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### SPIKES CLEANER UNIT

A 4 way mains distribution unit as above with a built-in Surge Arrester, providing protection for your complete computer system

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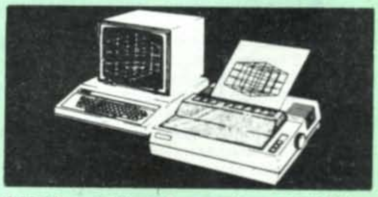

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THE BEEB BODY BUILDING COURSE

# Speed is of the essence

### *Mike Cook continues his Body Build Experimenter's Board series*

**WE looked last month at how to turn the motor on and off under micro control and how it could be made to stop more quickly when turned off using flywheel braking. I left you with the problem of writing a program to count the number of revolutions made by the motor after it was turned off and display the result.**

This is best done on the LED bar display but, as the first four bits reflect the relay state, we have to use the upper four bits. Remember that the cardboard on the motor cuts the opto slot switch twice per revolution, so we will have to divide any count we get by two. The major problem facing the program is not to get stuck waiting for a transition that will never come when the motor stops.

My solutions to the problem are shown in Listing I – Basic – and Listing II – Forth. Both assume the motor is controlled by bit zero and the panel below explains how they work.

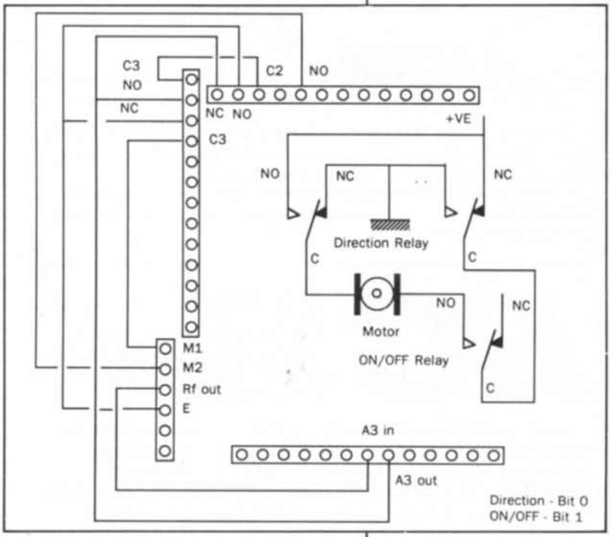

*Figure I: Simple direction control*

**BASIC** keeps the variable TIME constantly incrementing 100 times a second so we can use this to make sure the program does not get stuck. Line 40 sets the B side of the VIA to be inputs, line 50 is the time limit and 60 initialises the count. Then the motor is turned on at line 70 and allowed to run up to speed – lines 90 and 100.

The motor is turned off in line 110 and line 140 holds until the opto slot beam is broken or we run out of time. Lines 150 and 160 increment the count and display it and line 180 holds until the beam is unbroken or again we run out of time. Then line 190 tests to see if long enough has elapsed for the motor to stop. Finally line 200 prints out the result. Note that, as we are counting in steps of 16 and there are two beam breaks per revolution, we divide the resulting count by 32.

The **FORTH** listing takes a single page, and unlike other offerings it is entirely self contained and uses variables for the first time. Although it is possible to make Forth use the equivalent of TIME it is simpler to use a variable that the program itself increments. Line 1 defines a dummy word and puts the system into the hexadecimal mode. Line 2 creates a variable called *TIME* and a constant called *LIMIT*. When you compile this you will get a warning that the word *LIMIT* is not unique. However it is not important, so you don't need to worry.

The word H.L on lines 3 and 4 increments the time counter, looks at the opto slot and exits when it is low or we have reached the limit on our time. Similarly the word L.H waits for the beam to be unbroken or the time out. Line 7 defines words to turn the motor on and off with line 8 containing a simple delay.

Line 9 combines these last three words to turn the motor on, let it run up to speed and then turn it off – in other words pulse the motor – hence the name M.PULSE. Line 10 starts the definition of our final word that ties it all together: We reset the variable *TIME* and pulse the motor then put the count on the stack and wait for the first break.

When it occurs we increment the count – remember we are in hexadecimal, so adding 10 is a decimal 16 – and display it on the LED bar. Then we wait for the other transition and repeat this if we have not run out of time, and finally we print the result. Remember that as Forth works with integers, the number will be truncated to a whole number of revolutions, unlike the Basic version that could show a half revolution.

***Turn to Page 109*** ▶

**The Body Build Experimenter's Board was first described in the August 1988 issue of the *Micro User*. It enables you to learn about interfacing in a relatively painless way and contains many components which can be interlinked to enable a wide variety of experiments to be carried out.**

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VISA

◀ **From Page 107**

Both programs gave the same results which was about 14 revolutions for a simple on/off control and 1 or 0 for the flywheel braking. I thought I could improve the motor's free running by putting a small spot of lubrication on each bearing. However this must have been too much for the small motor as the viscosity of the lubricant damped the free running of the motor and after applying it I got a count of about eight revolutions.

Having seen how to turn the motor on and off, let's turn our attention to a way of controlling its direction. This is simply a matter of reversing the polarity of the voltage sent to it, and to do this we need to have both terminals connected to the relay contacts. As we have double pole relays it is a simple matter to arrange them to swap over the connectors while keeping a relay for on/off.

Figure I shows how to use the relay on bit 0 to control the direction and that on bit 1 to provide simple on/off control. Note that the relays used here must be the *break before make* type otherwise the supply will be short circuited. This means that the normally closed contacts *break* before the normally open contacts *make*. It is possible to get a *make before break* relay but these are less common.

If we want to have flywheel braking as well as direction control we can do this with the slightly more complicated circuit shown in Figure II. This time, just for a change, bit 0 controls the on and off with bit 1 controlling the direction. Turning bits on and off was comprehensively covered in the October 1988 article.

Now, let's have a go at speed control. The simplest way with a DC motor is to vary the voltage fed to it – the basis of most model train controllers. We can do this with the experimenter's board if we bring into play the digital to analogue converter – D/A – connected to the A side of the VIA.

If we connect its output to the buffer amplifier and the amplifier to the motor we can apply a variable voltage proportional to the number we output on port A. This is shown in Figure III, remember the reference voltage source must be connected to the reference input of the D/A converter. To control the speed you simply store a number at the address &FE61. Listing III shows a

**Turn to Page 110** ▶

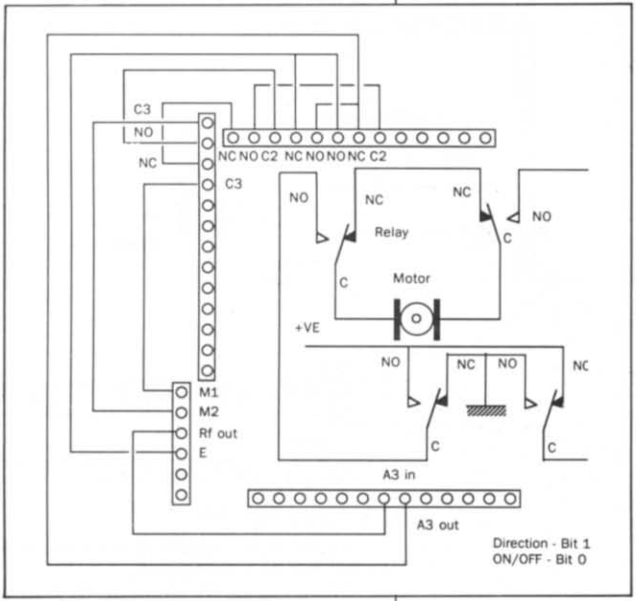

*Figure II: Direction control with fly wheel braking*

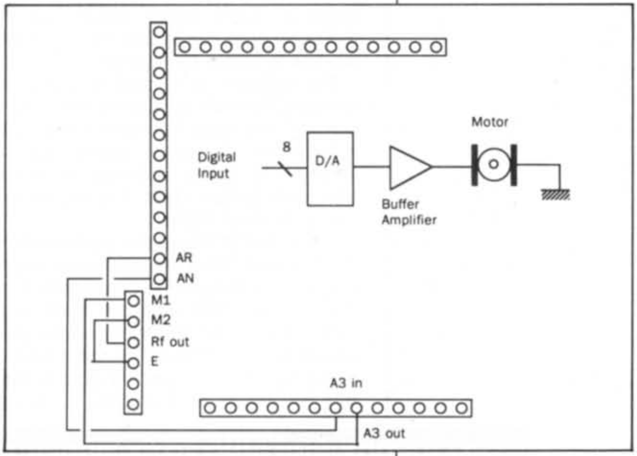

*Figure III: Simple speed control*

```
   10 REM BODY BUILDING EXPERIMENT BOARD
   20 PRINT"MOTOR TEST"
   30 PRINT"MOTOR CONTROL ON BIT 0"
   40 ?&FE62=0
   50 TL%=500
   60 C%=0
   70 ?&FE61=1
   80 PRINT"Motor is now on"
   90 TIME=0
  100 REPEAT:UNTIL TIME>300
  110 ?&FE61=0
  120 REPEAT
  130 REPEAT
  140 UNTIL (?&FE60 AND &40)=0 OR TIME>T
L%
  150 C%=C%+16
  160 ?&FE61=C%
  170 REPEAT
  180 UNTIL (?&FE60 AND &40)=&40 OR TIME
>TL%
  190 UNTIL TIME>TL%
  200 PRINT"There were ";C%/32;" revolut
ions"
```

*Listing I: Counting revolutions in Basic*

```
SCR @ 6      6 H
0 ( MOTOR MONITOR TASK )
1 : TASK ; HEX
2 VARIABLE TIME 600 CONSTANT LIMIT
3 : H.L BEGIN 1 TIME +! FE60 C@ 40 AND
4 0 = LIMIT TIME @ < OR UNTIL ;
5 : L.H BEGIN 1 TIME +! FE60 C@ 40 AND
6 0 = NOT LIMIT TIME @ < OR UNTIL ;
7 : M.ON 1 FE61 C! ; : M.OFF 0 FE61 C! ;
8 : S.DELAY 5000 0 DO 1 DROP LOOP ;
9 : M.PULSE M.ON S.DELAY M.OFF ;
10 : T.STOP 0 TIME !  M.PULSE 0
11  BEGIN L.H 10 + DUP FE61 C! H.L
12 LIMIT TIME @ < UNTIL
13 ." There were " 20 / . ." revolutions "
14  CR ;
15 DECIMAL
```

*Listing II: The Forth revolution counter*

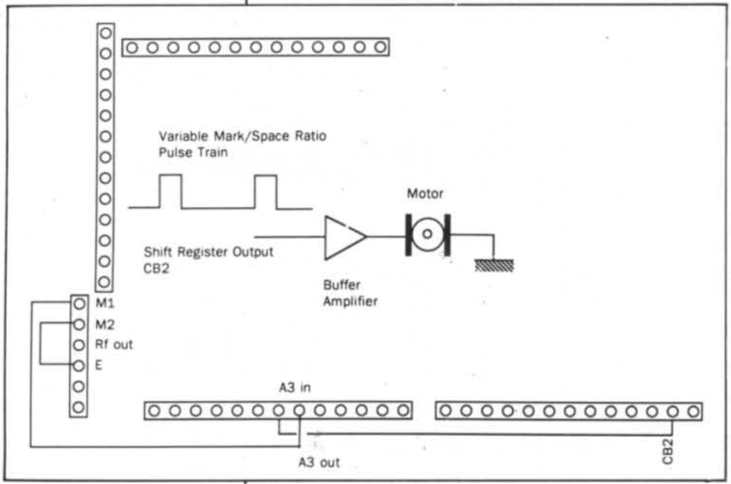

*Figure IV: Pulsed speed control*

◄ **From Page 109**

simple Basic program to allow you to send different numbers to the port.

By pressing the keys you will alter the number sent and when you run the program you will notice that the range of control is very small, which is partly due to the output impedence of the buffer amplifier and partly due to the technique itself. You will find that, once started, you can make the motor run much slower than the initial starting speed. This is part of the trouble with this technique of motor speed control, as the voltage drops, so does the speed, and the torque is soon too low to rotate the spindle.

The solution is to use a pulsed technique, applying the full voltage to the motor for short periods. The ratio between the on and off time will control the motor speed, but as the full voltage is being applied it is developing maximum torque while it is on, so the average torque is much higher.

We looked at the shift register in the December 1988 article. What we need to do is to use this in the re-circulating mode to generate a pulse train. The number fed into the shift register will determine the on/off time, and the pulse train is output on control line 2 on the B side – CB2. The wiring for this is shown in Figure IV the beauty of this technique is that once it is running the hardware takes over and there is no need for software control.

```
   10 REM BODY BUILDING EXPERIMENT BOARD
   20 MODE7
   30 PRINT"MOTOR TEST 2"
   40 PRINT"Press > to go faster"
   50 PRINT"Press < to go slower"
   60 PRINT"Press space bar to stop"
   70 REPEAT
   80 A$=GET$
   90 IF A$="." THEN V%=V%+1
  100 IF A$="," THEN V%=V%-1
  110 IF A$=" " THEN V%=0
  120 IF V%>255 THEN V%=255
  130 IF V%<0 THEN V%=0
  140 ?&FE61=V%
  150 PRINTTAB(0,8)"Current value ";V%;S
PC(3)
  160 UNTIL FALSE
```

*Listing III: Sending numbers to port A*

Listing IV shows a simple Basic demonstration program that will not only allow you to send different pulse trains to the motor but also draws a graphic representation of them. You can see that with this technique you have a much greater range of control than with the variable voltage technique and you can run the motor much slower.

However, the motor used here is a very low power one and won't develop much torque anyway – it's easily stopped with your fingers. Nevertheless the same technique can be applied to DC motors of any size. About 20 years ago I used this technique for controlling some fork lift truck motors.

To preserve the motor's life don't let it stand stationary for long with current going through it as this *stall* current is higher than the normal running current, and could damage the contacts if left on too long.

● *Next month we will explore some more aspects of the Experimenter's Board's flexibility.*

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```
   10 REM BODY BUILDING EXPERIMENT BOARD
   20 MODE4
   30 P%=&1F
   40 ?&FE6B=4*4 :REM SHIFT REG MODE
   50 ?&FE68=&FF :REM SET T2
   60 ?&FE69=&FF
   70 A$="."
   80 GOTO 100
   90 A$=GET$
  100 CLS
  110 PRINTTAB(0,3);"MOTOR TEST 3"
  120 PRINT"Pulse width control"
  130 PRINT"Press > to go faster"
  140 PRINT"Press < to go slower"
  150 IF A$="." THEN P%=P%*2+1
  160 IF A$="," THEN P%=P% DIV 2
  170 IF P%>255 THEN P%=255
  180 ?&FE6A=P%
  190 PRINTTAB(0,8)"Current value ";~P%;
SPC(3)
  200 MOVE 0,100
  210 W%=&100
  220 M%=&80
  230 FOR A%=1 TO 8
  240 IF (M% AND P%)<>0 AND (W% AND P%)=
0 THEN PLOT 1,0,160
  250 PLOT 1,160,0
  260 M%=M% DIV 2
  270 W%=W% DIV 2
  280 NEXT
  290 GOTO 90
```

*Listing IV: Sending and graphing pulse trains*

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The most prolific producer of games for the BBC Micro has possibly 10 or more games scheduled for the coming year, including its next release **Barbarian II** and at least one other **Play it Again Sam** compilation in the pipeline.

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IMPACT

Both these companies have some superb games planned – **Orbital** has just been released by Impact, while **Superman** and **Circus Games** from Tynesoft look stunning. Many more are on the drawing board.

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Three companies with very different ranges of software. Topologika is famous for its excellent adventure games with **Avon** as its next release.

CDS has great plans for the next 12 months. Greatly respected for its sports releases it has just released **Football Director**. In its Blue Ribbon range you will experience the very best in budget titles – the ageless **Steve Davis Snooker** is a good example.

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TOPOLOGIKA

For Archimedes owners there are some very exciting plans involving companies not usually seen in the BBC Micro market – plus old favourites Grand Slam, Rainbird, US Gold, Minerva, Dabs Press and Topologika. Together they offer an overview of the different types of games which can be played on the Archimedes.

**Pacmania** is Grand Slam's latest release and is beautifully addictive. Rainbird has brought you **Corruption** by Magnetic Scrolls and is about to introduce you to the world of **Fish**.

US Gold's first release for the Archimedes – **Joan of Arc** – is imminent and for golf fans **World Class Leaderboard** is an absolute must.

The most productive games company for the Archimedes has been Minerva which is continuing its support for the machine with **Thundermonk**.

Dabs Press has brought games to the Archimedes screen almost since the machine's inception and its latest – **Arcendium** – sucessfully converts some popular board games.

Topologika's adventures work on the PC emulator but it too will be making the transition to true Archimedes games.

*(Don't forget to tick Archimedes in the 'Your Micro' section.)*

# READER'S SURVEY

**You don't have to fill in an answer if you don't want to. You may photocopy this page to protect your magazine.**

## ABOUT YOU

How old are you?
☐ Under 11
☐ 11 - 15
☐ 16 - 18
☐ 19 - 22
☐ 23 - 30
☐ 31 - 39
☐ 40 - 50
☐ Over 51

Sex? M/F Occupation?____________________

Please tick the square which matches your level of interest in the following areas of computers or computing (0 least – 5 most)

| | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| Business | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Arcade games | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Adventures | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Comms | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Programming | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Hardware | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Desktop publishing | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Future tech | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Learning about: | | | | | | |
| Programming | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Hardware | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

How do you rate your knowledge of the following subjects? (0 none – 5 excellent):

| | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| Basic programming | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 6502 Machine code | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| ARM code | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Hardware | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

## YOUR MICRO

What micro(s) do you own or use?
☐ BBC Model A or B
☐ BBC Compact
☐ BBC Master
☐ Electron
☐ Archimedes
☐ Z88

How long have you had a BBC Micro?
☐ Under 1 year
☐ 2-3 years
☐ 1-2 years
☐ 3+ years

Which other computer do you have (if any)?
____________________

Which other computer are you thinking of buying (if any)?
____________________

What other hardware do you have?
☐ Monitor ☐ Colour ☐ Monochrome
Make____________________
☐ Disc drive ☐ 40 ☐ 80 ☐ Single ☐ Double
Make____________________
☐ Printer ☐ Daisywheel ☐ Dotmatrix ☐ Laser
Make____________________
☐ Modem Make____________________
☐ Sideways ram Make____________________
☐ Teletext Make____________________
Please list any others:____________________

What do you use your BBC Micro for (fill in your own ideas in the spaces at the end of the list)?

| | Only | Mostly | Some | Seldom | Never |
|---|---|---|---|---|---|
| Arcade games | ☐ | ☐ | ☐ | ☐ | ☐ |
| Adventure games | ☐ | ☐ | ☐ | ☐ | ☐ |
| Programming | ☐ | ☐ | ☐ | ☐ | ☐ |
| Business | ☐ | ☐ | ☐ | ☐ | ☐ |
| Own letters | ☐ | ☐ | ☐ | ☐ | ☐ |
| Home accounts | ☐ | ☐ | ☐ | ☐ | ☐ |
| .............................. | ☐ | ☐ | ☐ | ☐ | ☐ |
| .............................. | ☐ | ☐ | ☐ | ☐ | ☐ |

What type of hardware would you like next for your micro?
____________________

Please indicate which of the following types of software you have:
☐ Word processor
☐ Database
☐ Assembler
☐ Spreadsheet
☐ Other languages
☐ Basic utilities
☐ Disc utilities

What type of software are you most likely to buy next for your micro?____________________

What software do you use most frequently?____________________

Is there any software (apart from games) you've bought that you never use?____________________

## THE MAGAZINE

How long have you been reading *The Micro User*?
☐ 0-3 months
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☐ 2-3 years
☐ from issue 1

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☐ A friend

How many other people read your copy of *The Micro User*?
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What other computer magazines do you regularly buy?____________________

What do you like most about *The Micro User*?____________________

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| Hardware reviews ........................ | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Body Building ........................ | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
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| Utilities programs ........................ | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Archimedes ........................ | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Z88 ........................ | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Offers ........................ | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

Indicate any articles or series you would like to see in future editions of *The Micro User*.____________________

Any other comments you would like to make about *The Micro User*.____________________

Thank you for filling in this survey. Please send it to:
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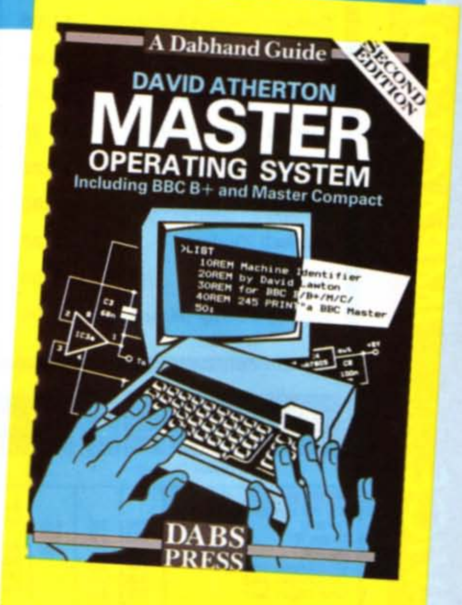
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# 3D Asteroids

*Blast the belt to smithereens with Douglas Pirie's help*

**NOW you can get the best of the hordes of floating rocks – before they get the best of you in this stunning version of the classic game using solid graphics. Just type in the listing and ensure it is correct with Get it Right! and save it. When it's run it generates a pure machine code program called 3D-ROID which is automatically saved. To play the game type:**

```
*3D-ROID
```

Only three controls are required – rotate left, rotate right, and fire. By default these keys are Q, P, and the spacebar but they may be redefined by pressing K.

The game starts after you press P and select a difficulty level. You have a pilot's eye view of the asteroids spinning smoothly towards your ship in the upper half of the screen, and a radar display in the lower half. Turn your ship until an asteroid is roughly in the centre of the upper screen and then blast it. The further away it is, the higher the score you get. But keep an eye on the radar for rocks approaching out of sight from the side.

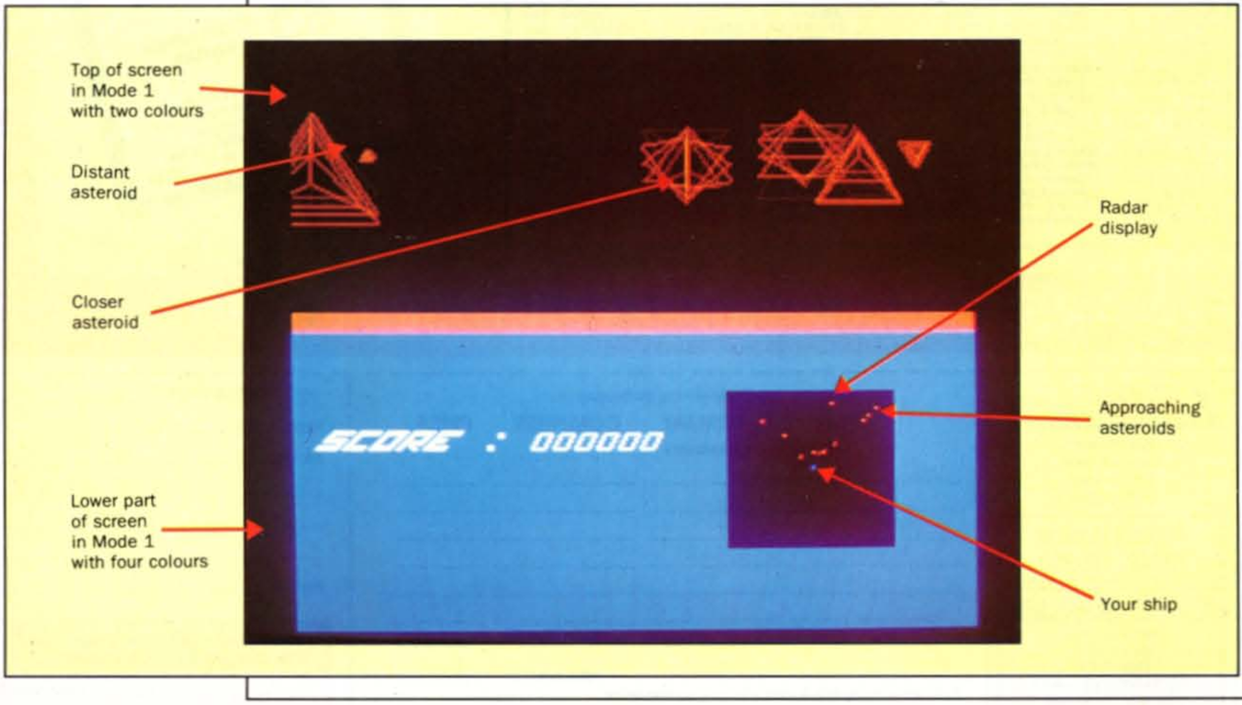
The sound is fairly rudimentary since the program disables all normal interrupts in order to boost the speed as much as possible. It replaces the normal routines with two of its own – one for simple sound effects and one to switch colours half way down the Mode 1 screen. This colour switching allows the use of four colours in the lower half of the screen, while using a colour swapping technique in the upper half produces flicker-free animation of the asteroids.

The screen has been shrunk to a width of 256 pixels, so the program incorporates its own specialised drawing routine which provides full hidden line removal for all shapes on screen.

The only illegal activities the program performs are direct access to the screen, video ULA, and both VIAs, and intercepting the interrupt vector. It also changes the values of some of the video processor registers, but this is done through the standard VDU23 operating system call. Despite all these tricks it still works correctly on all the 6502 BBC Micros.

Unfortunately, due to its length the code has to be presented as data statements rather than assembly language and a short routine is used to convert these into code. However the compression method ensures that you don't have to type in too much. The checksums were generated with the new program printed in the February 1989 issue of *The Micro User* which works correctly with complex data statements. If you use the old program or the one on the monthly disc the checksums will not match.

So away you go for some carefree blasting.


Top of screen in Mode 1 with two colours
Distant asteroid
Closer asteroid
Lower part of screen in Mode 1 with four colours
SCORE : 000000
Radar display
Approaching asteroids
Your ship

```
   10 REM 3-D Asteroids
   20 REM by Douglas Pirie
   30 REM (c) The Micro User
   40 MODE7:S%=&4000:HIMEM=S%
   50 PRINT'CHR$134"Generating code"CHR
$134"This should take about a minute"CH
R$134;
   60 A%=S%:REPEAT READ L$
   70 IF L$<>"END." PROCbytes(L$)
   80 UNTIL L$="END."
   90 DIM X%80:Y%=X%DIV256
  100 $X%="SAVE CODE "+STR$¯S%+" "+STR$¯
A%+" 1900 1900":CALL&FFF7
  110 PRINT''CHR$129"*RUN CODE"CHR$131"t
o play the game...":END
  120 DEF PROCbytes(L$)
  130 VDU46:IF POS=0 VDU134
  140 FOR P%=1 TO LENL$ STEP 4
  150 p$=MID$(L$,P%,4)
  160 ?A%=FNv(ASCMID$(p$,1))+FNv(ASCMID$
(p$,2))*64
  170 A%?1=FNv(ASCMID$(p$,2))DIV4+FNv(AS
CMID$(p$,3))*16
  180 A%?2=FNv(ASCMID$(p$,3))DIV16+FNv(A
SCMID$(p$,4))*4
  190 A%=A%+3:NEXT:ENDPROC
  200 :
  210 DEF FNv(C%)=C%-63
  220 :
  230 DATA lQ_?LAb?lU_?LEb?lyc¯HCO£?siZ
  240 DATA }VW?_A?£EQw£Cagg@cIq_O¯¯aMOi
  250 DATA KAA¦¯JY?hQ?Gs¯NGu?QiOUwah]Z£
  260 DATA KeiwDuGG¦m@GkiPBIg?F?_pHSo_£
  270 DATA STf[m@ARdXE\_?AGy?q¯dmGGPj@G
  280 DATA ki££STf[m@aSh\EYs@AGy?q¯dqGG
  290 DATA Pj@Gki££Ede[d@AG_?AG_?AGy?q¯
  300 DATA duGGPj@Gf¯NGki@GOHVXrLFGJ@aX
  310 DATA nHFGmTu\_kUXxLFJ_{e[_?DGs¦EG
  320 DATA opUWx@aJ_wq¯_?}¯h{\qJ@¯PHBDs
  330 DATA rBQc\?Ad_?Ar\?qE¯cI?DYW£FUGa
  340 DATA DIWi@Sw_h}^£?TG_hAW£FHiD_sFH
  350 DATA IjKCxBQcdcY?DyGG}UAGhDQhMAl¦
  360 DATA KPSE_oiEKWGGRTEZdLE\_wUXv@AR
  370 DATA DXCT_kUXx@aJ_wAGm?q¯_OhEDmGG
  380 DATA ki@BEAqSdpUXbPFGmTu\_GTQF£CT
  390 DATA _kUXx@aJ_wAGm?q¯_OhEDqGGki@B
  400 DATA EAqSdpUXbPFGmTu\_WSQQTCGjTU]
  410 DATA _wAGm?aJ_{NGSiP£LAafYcYDaA?G
  420 DATA s¯NRFd@G]iPhkBN¯H?GWhIP£[dyC
  430 DATA _O¯¯ErDsxBEYDqBYDuB£Q@I?erBs
  440 DATA AW]NpqRq¯Bn@_w}¯KXjEduBQdqBQ
  450 DATA cIDWH@GMhB@QIhcQITWXhYO£adI?
  460 DATA DMEGEPAYwS}QgeZAZ?@CH@Gix}sE
  470 DATA HjA{H?az¯bKsrBaz¯Bqx¯BUSrORL
  480 DATA ?ar_lwd£k]TPS\RQx?rVnEbKCHdL
  490 DATA T¦CSZXZb@£dPXhsQ?hRd[MtOF£cR
  500 DATA KlRVdmjU¯YdOLpaJnSkqPR¦tYvLw
  510 DATA brdxePbIe\bIB@ARdXE\iKSWoLFG
  520 DATA KleIQTE\tHfZiKDYhXE\_osYiOSX
  530 DATA kTE\dhaXogqO_OsZvxeIB@QTohAT
  540 DATA £HeIR@VWbTeIB¦E[xhQPrLUWoTeI
  550 DATA eDbIeHbIeLbIeTbIeXbIe£bIedbI
  560 DATA B@aSh\EYshA]lAb?LQ_?lEb?LU_?
  570 DATA h}VbMx^bmx^bLx^blx^h?sgR}VY?
  580 DATA Lye¯hEW£FdiADECUhY@Gm¯¯iF?az
  590 DATA ¯Ji?_oiE_?QbCuX_rsAP_Cs[sTe[
  600 DATA ndEXr@AGAdFGC@AShHVYd@AG[u_A
  610 DATA ¯jKsTVi£OnOpFA¦@DbGsBoCG\GiA
  620 DATA daWv?W@cQ?LFd]Wv@W@cH?¦CdYWv
  630 DATA AW@kKgGEht_i_JFs]rCG\?yX_VE{
   40 DATA UcYBDqTmrVPe?W@aErDstjGEht_i
      DATA OZ]hGeh¯TSy£X}¯DdYWe?W@eWcE¦
      DATA DyRiTcE?D}BGkiPBIgo_B¦eZfHVW
       ATA sTFZ£PVYnxu[£?AGX¦U\fGVX_OUX
         A £PeJLg_AEAASkTUWrTEGdxE\dHFG
           x¦U\q@aZ£tUX_gBG¯BI?_?}¯Hv?{
           kcKGOU¯q?AZ{H¯FsK_GKE?az¯rSt
            K{£BkAOaOiF?az rSt[?az¯FhN
             \r?j?{FcIGPyBqOVNGkip^¯¦v¯
  730 DATA ¯toAJko¯hEO£BAI?_[}¯_oiE_?AG
  740 DATA _{¯hBeC_H¯GcAcm@_w}¯dMGEh@BG
  750 DATA m¯NGki@Gl?q¯hiO£[dJ?U?az¯bkp
  760 DATA [@\¦_oiE_wAGm?aJ_{ngAcJ?UgcQ
  770 DATA IhCEh@BGm¯¯m?WPIN_PYo?az¯bkq
  780 DATA OOMGf¯nxBUy_Hf?KUAEGki@BICwS
  790 DATA dpUXbPFGCdeXeduWtpE\x@ARdXVX
  800 DATA k@AIp?QJ_ORI_{NG_¯NMhFRqC?j¦
  810 DATA DEep£@E??g?G¯@Y?aAOiOAA¦¯JI?
  820 DATA ¦ecF_w}¯gBmIOV¯bOLOi?tWSBGI_
  830 DATA _AOiGSw_h]@Gm¯na_w}¯xMfF_w}¯
  840 DATA GZ{_OVNy_JHsbBI?xMoF_w}¯GBKE
  850 DATA OVNg?OGNaIOi_TWNh}^c{_KszZ]N
  860 DATA IBl¦hAS£{cYYDubgGcI{_}Vc{_GC
  870 DATA zZ]NevbqOJNWUCoD?C?O????????
  880 DATA V?_?Y@???????[@?K_????????oD
  890 DATA ?s??????????@K_@N{@?¯¦n¯{Fo{
  900 DATA er{f¯{v¯?AO?B[}r^}RWBZGBxN¯x
  910 DATA NbHK¯¦NeKc¯{e¦{fo{v¯}rN??A??
  920 DATA ?A??Ko?????o?BoE£GaOCPG}?C_@
  930 DATA [_?C_?M?NC_?[?AOoB_FAO?EC_?{
  940 DATA ?c_CcwFAO?A?F_?C{O?AoBo@G?@N
  950 DATA C£G{?{£?C_?C_?C?NC£G{OCaoBoB
  960 DATA PGANG?@wV?oA??????????{PEPCP?
  970 DATA ?Eg_BQW£EAq£wdy¯Lyc¯Lye¯hAOb
  980 DATA jx^i¯vGY}vWY}fySLQ_?h}PbDGOi
  990 DATA hVg?h}P£Bci_Lyc¯hAYbmx^i?Sga
 1000 DATA W@Ujlx¯Jmx¯I_?\Bluc¯lwc¯hG?s
 1010 DATA £TI¯?tWZ}bHQ_}OmH?Qb£wNaO[¯h
 1020 DATA IANJh}^bBxNhHeZE_?\@DiGRi}@G
 1030 DATA n}PmY?QIBg_AH?IGn}PmY?aQI@qj
 1040 DATA ^_KqCeGYgUI¯?tWO}vIO}fA{LAc¯
 1050 DATA ijmyijmyij]AGsGO}BezBGObLxNe
 1060 DATA G@yBpIOb£wNaO_^iOsGY}fyHLee¯
 1070 DATA g£Yh{Bc¦e^¦puYydFYfXV\cLe[p@
 1080 DATA uZmtEZjhUYw\f\tPv[qDFWnxV¯kl
 1090 DATA e]x£sPuSBPBHRKOnNkZExMqllSzL
 1100 DATA rESlJXZTv}Dmhdz[yuvmF}z¯?Gy¯
 1110 DATA ¦EKG\A_BIBp¦hAO£{ciBDuBg?IiB
 1120 DATA ¦IJGGhKCxJL?gTGS¦A_BDyCKCcI?
 1130 DATA oJOi¯VwR_gxHdmSc{_Ky_BGscBK?
 1140 DATA Onlx¦SYNHZ@sRJI?_qOm[DQf?W@y
 1150 DATA GA£¦_bEsoBegVcy¯TQ_qOkngJcI?
 1160 DATA \mSHIB£}lYh?DyVjTIO£¯@U?AK?@
 1170 DATA DW?AK?£D[GAIqksrm¦{rh]TihIXK
 1180 DATA QIhbwwgbA_bbAwxP]yHtFxHtk}zQ
 1190 DATA ¯qyQSm]OjRXOMi@JYwGJZYcPZA£P
 1200 DATA E@£mdTemoVUXoRl[qP¦nkpuntQDT
 1210 DATA teJJapQmkoAq}Jf¯Gzn¯c@?fcPE?
 1220 DATA [QE??oH??OE?[A???OEf???X[A??
 1230 DATA cpH??OE?[A?X[aDUWpDVcPEXihe[
 1240 DATA qHf\u@?@Go?D[GAImWbNAXcQP@??
 1250 DATA ??AG_?Q]c¦eWnxchKeY]_O¯¯_B?C
 1260 DATA C?I?o¯_hJAA¦¯BM?OO?g@?l?_}N£
 1270 DATA @IiDENGCCcy@DMWnx£Q£EtZcgSGV
 1280 DATA dEGCBoSKasJ]g_S£atZ]g_S£bdy¯
 1290 DATA DUEGEPQhL£ShK£SnOaQ£atZcgSwW
 1300 DATA huO£d@aPcSY_oB@YWSER\aFIgTUR
 1310 DATA \eFIK¦]Gg£RxKtH]g_UxLtX]g_U£
 1320 DATA b£U£aTY_ovOi?_RxaTgWhAOxbTwW
 1330 DATA huO£d@aPcSYRGTIRGtJcgSgW¦EHI
 1340 DATA DMUi¯VWX_WCHg£PXKtHcg_UXLtXc
 1350 DATA gsZcg?p?KtkGdMG{BoCsacY_hDWn
 1360 DATA x£ACEcs¯WcU?wu\cg?XMD}Snw£A[
 1370 DATA Hcs¯WcU?oJ_pNTgRtYUtf@J@t]Ud
 1380 DATA eTGS_gxH¦AHIDySnPaQ£NTyQDADG
 1390 DATA Y]QhJTxXK@lG¦EHID}SnOaQ£MTzX
 1400 DATA TZEkCSjXT]U£O@aefsJ]gSgR¦eFI
 1410 DATA D}ShJTGS_gxH¦eFIOgOi?_RxJThX
 1420 DATA K@lGdmSdepCsaw\cgsZ]g?pDtYEM
 1430 DATA i?x?}fFI¦£FI\aFIO}£¯x£ARDKQl
 1440 DATA e£bIOM_vx£Q£MtJ]g_RxMtH]g?z?
 1450 DATA ]fFIt]EMiSgROM_vPaQnOaAMdzSf
 1460 DATA OaAkBw\cg_PnPaQP[dA¯oN?Mo[Ph
 1470 DATA EtT]gcA¯o?AsA?x?_c¦GIjKKeosc
 1480 DATA £sZcggCM\DHIh?C{\BQ¯cosMbsZ]
 1490 DATA ggSVx£QI?@¯u_sFHKlrGl]wZh[Vb
```

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◀ From Page 117

```
1500 DATA F}Uh?A|GEBWhB@nMhAO£{ciMDubg
1510 DATA ??I?pqBKE?I_pqBKdW]NgR}OOv]i
1520 DATA xXYb_O^^IUc_OC£aDIGCKcY?DAWi
1530 DATA ?SWahEO£IAUnM£aAiAqTdsy?As{?
1540 DATA A?^}hAOb£w^iOsWG}fIOLEa^hATb
1550 DATA £wNR|PaaI£YmJTQQ^FA@@QOi?TGN
1560 DATA heU£|sZcgcC_IhSQ^bPY?£SIwjcQ
1570 DATA dtR£|_UIF_PX{SGNOI_x|sZ]gcC_
1580 DATA IhCQhonAdpR£{?h?evRiGSWQgdq?
1590 DATA DuD{EWSQEvDsyVYQXmSH_AOC{CHN
1600 DATA dqRdCSYNTU?WhAO£JTGRDuSpb@B@
1610 DATA oJOi^VGXETEcRSiWWSuQDmShbTER
1620 DATA DqShcTURDuShd@^AEGeHbXAXK£DH
1630 DATA _@qGdSYWocAsscy?DATi?SwRdyV£
1640 DATA M@aefSyQIShXhAO£NTy^DyCGY]Qh
1650 DATA JhOdfpsvcSi^IThXd}fQT]ER^RQq
1660 DATA @?\EdyfQDmcQWSuQTYUh^hS£JhCE
1670 DATA dlSdfpsvcSi^TYUh^TxXh}VfPaQi
1680 DATA ^vHcg?qGdSy^\aFIdyVfx£ARXNQh
1690 DATA }@BBhAWfx£Qi?sH]g?nAh}Vfx£Qi
1700 DATA ^vH]g?qGdSy^\AHIdyVfPaARXNQh
1710 DATA }TgWd}V£bdyQDUEGEPQhJ£PYITwQ
1720 DATA OI_xKTyQwS]RDyVhKdM?D}FW_?QO
1730 DATA L?AG_?AG_?AGhAO£CUW£|EHIHREc
1740 DATA EcMXeRGsufkAOYOyIW]£OZ^£QTY£
1750 DATA Ig_AIS_SwbPXEUg£dQWXFUw£hAOX
1760 DATA GUGaWfyF_w}^hMAGm^^iP?az^Bi?
1770 DATA xYG?IhcQI£PYGAaz^fj£?cqBWcEa
1780 DATA _w}^GAPx_dI?DyRiySwNaY?g?dI?
1790 DATA PyBq?BKsxfy^PyBq?BCsxZ}NIB\y
1800 DATA hAO£ChIieBSh?d{BOQOi?SGOh}^£
1810 DATA AtZ]gc{?OGPq|BbB|EHIHN?CFc[^
1820 DATA o?BRL_QnPaQq?@jH|aFIDYSnx£AC
1830 DATA KcI?wSmPDYSi?s^]gs\cg?xCOfOh
1840 DATA E@R@|AHIo_?ygBMEORJ{XggQXQDI
1850 DATA GvJcgcHTg_[nPaQeS£AqeJCR|WQh
1860 DATA ATwOeNcAWSeODIDCBocMfOiSWiYm
1870 DATA U£AaGaGKPclTg?b|O^]mW£QuT£Ac
1880 DATA hBZxcQSnS£QeM£aAgiSX?d{BOQOy
1890 DATA N?L}DESmw£Q£MdZ]gSwRxEHIGTGS
1900 DATA xAHIIWASh}VfU£AGY]Qi?SgPgdA^
1910 DATA Ig_AeWcAeWcAeWS£{SiPWceBDubh
1920 DATA @pjN£sJigSWPaAOk{_PXJTHFh?GS
1930 DATA AcC_oZOi^VXFoOOi?SXFgbMqcVCK
1940 DATA _BnveECnLDag?CJNTqAKCcI?oJOi
1950 DATA ^VXJgbMqcVCKjB^y_ONIEJCKJWMP
1960 DATA dQSqE?^?K|eHdAGK[cy^DQSiCSWP
1970 DATA aUOnvaQd[sZngSHJIBp{_ONIEBWh
1980 DATA FdAAO^OixByFKluHheMg^_V£AOw?
1990 DATA WdIODuBg?OGNaAQiNOqPOJOioVWQ
2000 DATA pqRHHDHNGB||evbqOJ^hFdCaD]CW
2010 DATA dAT£HdI?DmS£^TyRO{_x^dI?wSmR
2020 DATA DySi?S}RD}Si@SgQhAO£PTyROZOh
2030 DATA MTKSOab@OXQSdETpN@j@EgCsqBNI
2040 DATA ObOhMTKSoZ?koZSSe@ThM£RxOTgR
2050 DATA d}SxPTwRdmCEdhS£JTYQDADsuUyV
2060 DATA o^Oi?_RxJTwQ_@Q[fWkb_AOiX@al
2070 DATA gcyU_gAIxMKIoZ?Gn}@qOnMWG@Aj
2080 DATA Y[@?A{NY_w}^_oiE????????^Ji?
2090 DATA lM_?LN_?onnqOVNW_?AG_?AG_?AG
2100 DATA _?aODDDG_?A]^puZn@VB_?AG_?AG
2110 DATA _?AG_?ARC£DG_?A[nLVB_?AG_?AG
2120 DATA _?AG_?ARCdDG_?q\gTe[d|T]k_TB
2130 DATA _?AG_?AG_?AG_?ARC£DG_?qGEW_@
2140 DATA Mw_AIg_BMW_@Eo?BG}N??_F?C^N?
2150 DATA ?O{^^ZM}oFn{oFn{pJ^{qNN|rR^|
2160 DATA sVn|tZ^|u^N}vb^}wfn}xj^}ynN^
2170 DATA zr^^{vn^|z^^?SyPIhcQDacg?cY?
2180 DATA DmDGuiAkE?AkjocBhW{UtuPt^?BA
2190 DATA OVPl[SlFo}Oi@SgTIaIEhH?GYiAR
2200 DATA wcQi^VgTIaPYA_ia_ghItuQtn?BA
2210 DATA OVPlkSlJo}Oi@SwTIaIEhH?GgiAR
2220 DATA adQi^VwTIaPYA_ia__iIdeTpWdI?
2230 DATA DqT£\dE?DiDixaD?DuThZ@^?KTbI
2240 DATA EeShC£PYySwNdYDKAcI?D}ThV@b?
2250 DATA hAO£_TiUoJOiOSgPIaPXETgPdYCi
2260 DATA xq@?Xz@?OFPm\?Ou^??sHcI?Dmdh
2270 DATA HpCciWYQ_WjIoY?GomARtgahYTjT
2280 DATA WcFF?cHF?cZF?SvVXu@?ceSmk?Oq
2290 DATA ?@@EHBKKS_Sm\??KG_UQ?aYi^BL@
2300 DATA g£Yi?ChNIaYQ@gYlW£PX[TGVoUOu
2310 DATA W@?cOUIVwcNU?SGVdYSQO_YlU£P]
2320 DATA [?Oe[?Om\?O\^dXF?oChh?a}j?JA
2330 DATA deCg?C@NPqRhY@NAdQTtm?LEoJSh
2340 DATA RTlFOBPI?Ab@t}@sG?nKt}Pq^BNJ
2350 DATA diDGQjQhY@^@daDRshQhX£PX[TGV
2360 DATA oQOp\@hBdiTQ@?asiSIVwS]VDqDR
2370 DATA tgAygR]PoN?RMcAWEYcitq@Mxr@?
2380 DATA DadhE@e£EhYlk_R}k?O£XXiP_TZF
2390 DATA HF?CSc{^o?PT[cA_OjOllSDJh?Ks
2400 DATA A_@Ww?E{£TyTosaxSTITHBCC}W]T
2410 DATA EzTh]dq@H^?{JWKNdqRq^BLOEvBW
2420 DATA dqBMhf^£{SYNhFO£|?epSTITHBKK
2430 DATA PW[TezTh]dq@oB£x{?\EevBWhAO£
2440 DATA Z£EYK@hIdqBEhd^£{SYNhDO£|?Uh
2450 DATA U@PGWSuSoLS£RXOQoYOhHdACoj]h
2460 DATA GTWQdqBMhbO£{?ZvEvBWWSuSopP£
2470 DATA RXSQoYOhHdAAof[hFTWQdqBEh£O£
2480 DATA {?HnevBWcUTi^BL@cQTi?SwVh?W£
2490 DATA _TIPWceMD}BeD@Utm?NDHBCCOcKo
2500 DATA ooOh^DhNWaPXV£IRQmAR]kQi?TWN
2510 DATA tqP£R£PY?aSI{j?cAW]NDqRlkSGT
2520 DATA H@W£TdC_WcEOH|FQh_nQITUNDuBY
2530 DATA h[O£]TENDqBcAW]Nd]S£H£UIB?n@
2540 DATA gYSQGA|}_XgPhiR£^SySH@ghC@RG
2550 DATA oF@hSDlNOY?hTDlNO]£x^gKsnRYT
2560 DATA PzBkEOITPzBkAChNWWiP_X}NIB|}
2570 DATA PzBkEOITPzBkAChNwWiP_@A?XXXX
2580 DATA "END."
```

**Checksums:** *You must use the new checksum generator – from the Februrary 1989 issue – to check the listing.*

Get it right!

```
  10 =    0 0
  20 =    0 0
  30 =    0 0
  40 = 22D8 8
  50 = B0F6 C
  60 = 148E 0
  70 = 5C52 D
  80 = ADEB E
  90 = B09A D
 100 = 4811 B
 110 = BC0D 5
 120 = C278 2
 130 = 1332 0
 140 = A721 5
 150 = 365D 2
 160 = 56ED A
 170 = 25A5 A
 180 = F931 C
 190 = DE67 1
 200 = 9719 2
 210 = 769F 3
 220 = 9719 C
 230 = ABB6 D
 240 = 8694 9
 250 = C1E2 8
 260 = DD91 5
 270 = 3494 3
 280 = D026 C
 290 = 8F04 E
 300 = B359 C
 310 = 91F2 B
 320 = 2394 E
 330 = 9036 6
 340 = ACBF F
 350 = 3F86 E
 360 = 8286 B
 370 = 748C 0
 380 = 4ABC 6
 390 = E710 3
 400 = C7B5 5
 410 = 5C93 7
 420 = 4A8B 1
 430 = C811 E
 440 = 614E C
 450 = 7BC0 9
 460 = 5760 5
 470 = 9221 B
 480 = 9604 0
 490 = CAE2 B
 500 = 4A09 2
 510 = 3E97 F
 520 = 5005 1
 530 = EF83 3
 540 = 202C D
 550 = 1E95 2
 560 = 7A71 5
 570 = D5CC E
 580 = 1D33 0
 590 = FB61 5
 600 = FE37 0
 610 = 87DD F
 620 = B1EF 0
 630 = 78CF 8
 640 = DB58 F
 650 =  E93 1
 660 = 68F9 7
 670 = E25D 3
 680 = 3865 9
 690 =  610 F
 700 = F2EC A
 710 = 5E77 8
 720 = EB47 1
 730 = 9234 1
 740 = F804 6
 750 = F551 E
 760 = E3E9 0
 770 = C5FE 2
 780 = 8238 C
 790 = E032 F
 800 = C395 0
 810 = E332 E
 820 = 98BB 3
 830 = C05A D
 840 = 6324 A
 850 = 4FE4 D
 860 = 3A7E F
 870 = 90CF B
 880 = ED8C E
 890 = EE8A 8
 900 = F036 8
 910 = D8A3 0
 920 = A47A 5
 930 = B7E9 3
 940 = EE84 6
 950 = A18C 5
 960 = 6645 0
 970 =  5BC E
 980 = A599 2
 990 = 57D8 8
1000 = 6B2F A
1010 = 7124 8
1020 = 95BB B
1030 = B81E 0
1040 =  BA2 9
1050 = 3F37 B
1060 = E480 3
1070 = D37B E
1080 = D7FE E
1090 = 8D1E 1
1100 = AE62 2
1110 = C115 E
1120 = 1718 8
1130 =  96F 8
1140 = 19D8 1
1150 = 3192 8
1160 = E3A3 1
1170 = E08E 3
1180 = 53D1 C
1190 = 5E87 B
1200 = C3DF D
1210 = 676E 0
1220 = 1E11 D
1230 = FE96 7
1240 = 9646 B
1250 = 895F A
1260 = C6D5 2
1270 = 644C C
1280 = 85F1 2
1290 =  C43 F
1300 = 9C4E 8
1310 = 4962 B
1320 = C1C6 C
1330 = 9B6F F
1340 = 4929 8
1350 =  3C9 4
1360 = D28F 9
1370 = 7874 8
1380 = 199F E
1390 = 305E 4
1400 = 8BA2 8
1410 = E746 E
1420 = B4D4 F
1430 = 5638 A
1440 =  FBD E
1450 = A2FD 7
1460 = 9034 2
1470 = 1A10 5
1480 = 4F1D B
1490 =  BF5 8
1500 = 5376 9
1510 = B594 1
1520 = 9D5E 7
1530 = D8FB D
1540 = AC08 0
1550 = 8722 E
1560 = BA1E B
1570 = 8328 E
1580 = 78A0 C
1590 = E78E 1
1600 = C556 9
1610 = C5C2 3
1620 = 1508 3
1630 = AD3D 1
1640 = 8B6B 9
1650 = 999B 3
1660 = ECE1 C
1670 = 6160 2
1680 = 9A90 1
1690 = 8718 3
1700 = 966C 8
1710 = C5E4 F
1720 =  2EF 4
1730 = FC81 8
1740 = D06B 1
1750 = BBA2 4
1760 = 182F 4
1770 = 5BE4 8
1780 = D0BD E
1790 = AB9B 4
1800 = C0FD 3
1810 = 333D 2
1820 = 2560 0
1830 = 41DE F
1840 = 409F 1
1850 = FCD1 8
1860 = 887C 1
1870 = 7431 4
1880 = C6CA 0
1890 = 26EE 1
1900 = 37B2 2
1910 = 744A F
1920 =  C7B 7
1930 = F619 0
1940 = 1595 5
1950 = 37B9 D
1960 = D64A 9
1970 = EA74 8
1980 = 3F63 D
1990 = 7DC4 5
2000 = 115E 3
2010 = 8A22 A
2020 = 9144 B
2030 = 683A 0
2040 = 685B 0
2050 = 5C57 7
2060 = BD92 0
2070 =   B0 3
2080 = 62D6 8
2090 = D15E A
2100 = 2B96 8
2110 = A777 6
2120 = 437C 4
2130 = AF6D C
2140 = E875 0
2150 = 4883 5
2160 = A279 C
2170 = 880F B
2180 =  190 7
2190 = 5D35 1
2200 = 575E 4
2210 = 7D49 A
2220 = F216 8
2230 = B7D3 9
2240 = 314A 9
2250 = 66B3 7
2260 = 6230 D
2270 = 535D B
2280 = 58F2 7
2290 = F37D A
2300 = 5246 8
2310 = 5B16 9
2320 = 7021 3
2330 = D6C8 2
2340 = B51B E
2350 = 88C0 A
2360 = 4E44 1
2370 = 236B F
2380 = 4C14 5
2390 = 4648 E
2400 = 24C6 6
2410 = 7039 C
2420 =  1F0 4
2430 =  CAF 4
2440 = 5075 0
2450 =  32D C
2460 =  FFC F
2470 = F92D 9
2480 = CEDC B
2490 = B045 3
2500 = 18C7 F
2510 = 585B F
2520 = 9FFD E
2530 = 1C5C A
2540 = 77A3 8
2550 = 2E32 0
2560 = 8161 3
2570 = 8FFB A
2580 = E9B1 1
```

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# Statistically significant software

### Mike Mahon compares five statistical packages for the BBC Micro

> *‘You may need a stats pack for a number of reasons’*

**IN the early days of the BBC Micro there was very little software dedicated to data handling and data analysis, despite the micro's speed and graphics, which lend themselves readily to heavy number crunching and data presentation. This is surprising since the BBC Micro and its later incarnations are employed widely in schools and universities, research laboratories and industry where data handling, data analysis and data presentation are used regularly.**

Indeed, within these institutions homespun statistics packages were rife and now a number have emerged giving us today a choice from more than 25 regularly advertised statistical software packages.

From them we have chosen software at various levels of sophistication – from the simple to use, and simple to adapt, to the powerful packages which may interact with spreadsheets or databases. Here I will try to present the flavour of each, its strengths and weaknesses, rather than a complete account of every statistical descriptor or test offered by the software.

#### WHAT MAKES A GOOD STATISTICAL PACKAGE

● **Data handling:** Simple and fast data entry, single item or grouped data input, good labelling, options for alterations, additions and deletions plus data group combination and separation, mathematical data transformation and sorting. Save, load, print, porting to and from other packages.

● **Descriptive statistics:** Data group central tendency: Mode, median and means. Data spread: Range, percentiles, variance, standard deviation, coefficient of variation, standard error and so on. Data distribution: Binomial, Gaussian, logarithmic, skewness, kurtosis and so forth.

● **Comparative statistical tests:** For one, two or more data groups following normal or other distributions.

● **Association or Predictive statistics:** Linear and other correlations between two or more data groups, regression relationships between groups.

● **Graphical presentation:** Of raw, sorted or grouped data, descriptive statistics and regressions. Trend and moving average plots.

You may need a stats pack for a number of reasons. For example, if you have lots of data you may wish to present it in a more readable format such as a graph or histogram. You may also want to know the average value, highest, lowest and perhaps some descriptors of the shape of the distribution graph.

If you have more than one group of data – usually small samples from large populations – you may want to know if they are likely to be different from each other or whether any difference is due to chance sampling.

Where separate values have been collected from the same individuals, for example height and weight, you may ask if there is any relationship between them such that you can accurately predict one from the other. A good statistical package should therefore have a fair number of the facilities shown in the adjacent panel.

So let's see what some of the current crop can offer, bearing in mind the wide range of prices and needs of different users.

*Product: Statpack*
*Price: £13.74*
*Supplier: Micro-Aid*
*Address: Kildonan Courtyard, Barrhill, S. Ayrshire KA26 0PS.*
*Tel: 0465 82288*

THIS is the earliest offering of a statistical package for the BBC Micro and has been around on other machines since 1978. Written entirely in BBC Basic, Statpack provides an easily transportable and readily adaptable piece of software. The disc autoboots and is menu driven – indeed, it is so straightforward to use there is no manual.

It provides routines for data entry in user-specified rows and columns – up to about 1,000 values on a BBC B. Options include Chi square tests, linear correlation, regression and descriptive statistics – sum, SD, CV, range, median. It is particularly impressive in providing a variety of means – arithmetic, geometric, harmonic, progressive – not available on some of the more expensive packages.

Graphics are limited to text-based horizontal bar charts, though all results are printable. An excellent menu option is one which allows you to add your own data analysis routine. In my opinion this ought to be available on all statistics programs.

In summary, although unsophisticated by modern standards, Statpack still represents good value for money. It probably best fills the requirements of secondary school pupils carrying out survey data analysis. For the Basic programmer it also provides a good starting point for writing specific statistical routines. Statpack is compatible with all versions of the BBC Micro and Master, 6502 second processors and shadow ram.

*Product: Statspak*
*Price: £17.25 (5.25in disc), £19.55 (3.5in disc)*
*Supplier: Chalksoft*
*Address: PO Box 49, Spalding, Lincs. PE11 1NZ*
*Tel: 0775 69518*

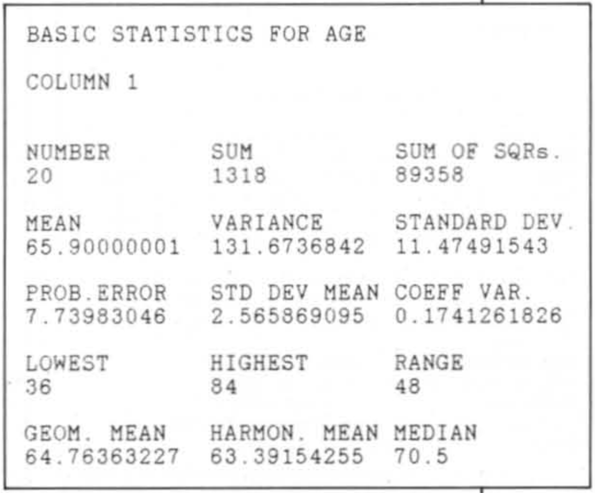
IN addition to providing statistical utilities, Statspak may be described as an interactive teaching and learning aid for mid-secondary school level and upwards. It has been specifically designed with a number of GCSE and A level subjects in mind.

The software autoboots and is menu driven, offering six options. Unfortunately data entry is limited – only positive values in one group of up to 56 data items or two groups of maximum 20 items each are allowed. Data may be saved, loaded, or printed and there is a limited facility to amend grouped data.

Descriptive statistics include range, quartiles, median, mode, arithmetic and geometric means, variance, standard deviation, standard error, coefficient of variation and skewness. Although only one comparative test – Chi square – is available, the association statistics are fairly comprehensive for a package in this price range and include Pearson's, Spearman's and Kendall's correlation coefficients, plus standard and inverse linear regression equations.

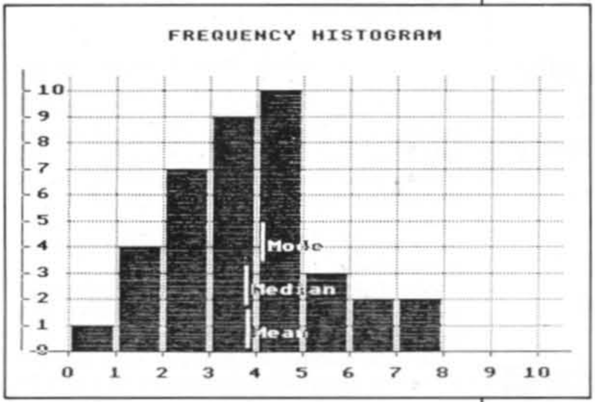
Statspak is particularly strong on graphical representation of data and results, and various outputs are possible – frequency histogram, cumulative histogram, graphs, scattergram with regression lines – all of which may be dumped to an Epson-compatible printer. Unfortunately Statspak has a most annoying feature – the opening animated sequence looks and sounds like a game and provides a major distraction and delay to the numerical tasks in hand.

The 12 page manual is adequate and gives example printouts and basic statistical formulae. Statspak is compatible with the BBC B, B+ and Master, but not shadow ram boards. It certainly represents good value for money and although limited in range is excellent in implementation.



```
BASIC STATISTICS FOR AGE

COLUMN 1


NUMBER          SUM              SUM OF SQRs.
20              1318             89358

MEAN            VARIANCE         STANDARD DEV.
65.90000001     131.6736842      11.47491543

PROB.ERROR      STD DEV MEAN     COEFF VAR.
7.73983046      2.565869095      0.1741261826

LOWEST          HIGHEST          RANGE
36              84               48

GEOM. MEAN      HARMON. MEAN     MEDIAN
64.76363227     63.39154255      70.5
```

*Statpack: Descriptive stats*



*Statspak: Frequency histogram*

*Product: Unistat-II (disc)*
*Price: £143.75*
*Supplier: University Software*
*Address: PO Box 383, Highgate, London N6 5UP*
*Tel: 01-883 7155*

UNISTAT-II is an integrated suite of menu-driven data handling, statistical and plotting programs and provides a considerable upgrade to the already highly acclaimed original version. The package is very easy to use even for the complete statistical beginner and the 100 page manual is fairly comprehensive.

Menu option zero allows alteration of default parameters such as screen mode, colour, data disc drive number, printer type and width, and data column format.

The powerful and comprehensive data processor – option two – is truly remarkable. It allows for data entry of up to 3,000 items in a spreadsheet fashion, with options for labelling, data alteration, insertion or deletion by item column or row, data sorting, copying, or data

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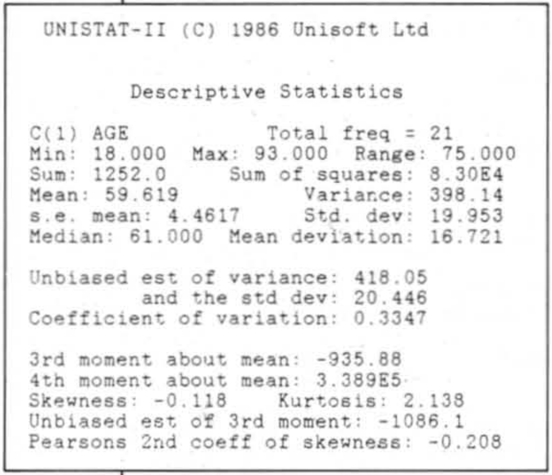
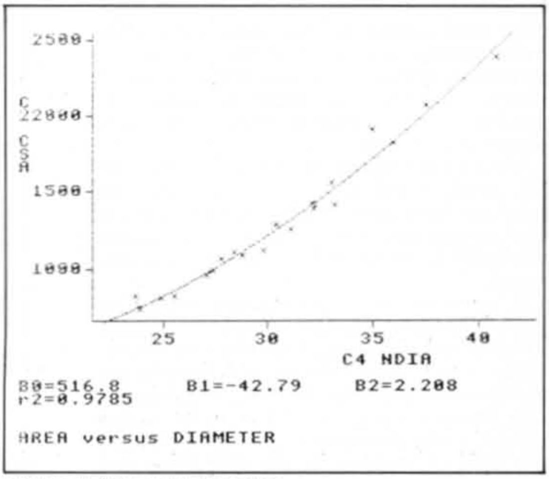


```
  UNISTAT-II (C) 1986 Unisoft Ltd

          Descriptive Statistics

C(1) AGE           Total freq = 21
Min: 18.000  Max: 93.000  Range: 75.000
Sum: 1252.0     Sum of squares: 8.30E4
Mean: 59.619          Variance: 398.14
s.e. mean: 4.4617     Std. dev: 19.953
Median: 61.000  Mean deviation: 16.721

Unbiased est of variance: 418.05
         and the std dev: 20.446
Coefficient of variation: 0.3347

3rd moment about mean: -935.88
4th moment about mean: 3.389E5
Skewness: -0.118    Kurtosis: 2.138
Unbiased est of 3rd moment: -1086.1
Pearsons 2nd coeff of skewness: -0.208
```

*Unistats-II: Descriptive stats*



*Unistats-II: Polynomial regression*

> *It's a pity you can't save time by selecting multiple columns requiring similar processing*

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transformation, format decimal places, merge, save, load, or print.

Columns can be identified as functions of other columns and therefore partially preprocessed data – grouped data – can be entered. A well laid-out function keystrip simplifies the use of this module. Data may also be entered in Ascii format from a text editor or spreadsheet, facilitating transfer between packages and even different micros.

Moving around the spreadsheet – except on the Master Turbo – is a little slow compared with rom-based software, and there are a few minor bugs in the routines. For example, data saved on a machine using the second processor was often corrupted on reloading to a machine without one. There also seems to be some problems in loss of the last data item when transferring from Inter-Sheet files.

Other menu options are also outstanding in their range of facilities. Each begins by requesting the data columns of interest and can cope with missing values. It's a pity you can't save time by selecting multiple columns requiring similar processing. The output of descriptive statistics is good but not exhaustive – where is the mode, geometric mean, or 90th percentile? Like all output from Unistat-II, results may be printed with a single key press and the same menu option also provides frequency distributions in text or plotted form as scattergrams, histograms or time series plots.

Option three gives the comparative statistical tests, correlations and data distributions. Most produce exact p-values obviating the need to check against books of statistical tables. Data can be checked against 14 different mathematical distributions – five of which I have never even heard of before. Parametric tests include paired and unpaired t with equal or unequal variances, and the variance ratio (F) test.

Nine non-parametric tests are available including versions of Chi square, Kolmogorov-Smirnov, Mann-Whitney, Wilcoxon, Walsh, and Wald-Wolfowitz. Non-parametric analysis of variance – ANOVA – for comparing a number of columns include Kruskal-Wallis, Friedman, Page's L trend, Cochran's Q, Jonckheere's trend, Somer's delta, Goodman-Kruskall's gamma and Kendall's tau.

Parametric ANOVA is available from a separate menu option and is extensive providing nine versions up to three way with two repeated measures. Correlations include Pearson's, Spearmans's, Kendall's, point biserial and tetrachoric. Multivariate regression – which looks at the associations of a number of data columns simultaneously – is impressive and could account for missing values and produce a correlation matrix.

Finally, although all other parts of the program can print the screen output, option six provides high resolution plots including up to six overlaid time series, scattergrams – unfortunately with only one regression line – graphical plots of functions and, most impressive of all, curve fitting and equations to polynomial functions. One item missing from this section, however, is a user-defined axes scaling routine.

Although Unistats-II can run on the BBC B, B+ or Master, and utilise shadow ram or the 6502 second processor, its protected disc format does not allow for transfer to ADFS or hard disc, and you can't add new statistical routines. Overall, Unistats-II is an excellent statistical package and I hesitate to be overcritical; perhaps this is owing to familiarity brought about by its ease of use.

*Product: Instat*
*Price: £85 (eprom and disc)*
*Supplier: University of Reading*
*Address: Statistical Services Centre, Department of Applied Statistics, University of Reading, Whiteknights, Reading RG6 2AN*
*Tel: 0734 861239*

INSTAT – INteractive STATistics package – consists of a 16k eprom which may be fitted into any rom socket of the BBC B, B+ or Master and a double-sided 80 track disc holding the dictionary of commands, Help messages and example data files. You are recommended to produce working copies for each application – spare labels are provided.

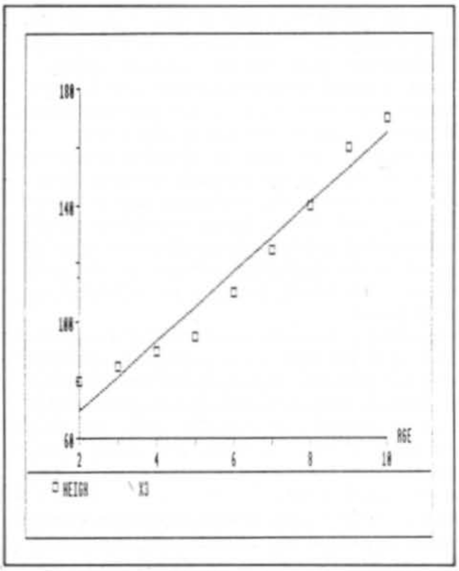
Documentation is thorough, and comes in the form of three lengthy manuals – a 150 page Introductory Guide, Reference Guide – 96 pages – and Supplementary Guide – 69 pages. A Programmers Guide and an Educational Guide are also available according to the supportive Instat Newsletter.

Instat, although similar in scope to Unistats, is implemented in an entirely different manner using around 90 three character commands. Data entry requires setting up of a worksheet and the use of REAd and ENTer commands. Although memory held worksheets are limited, disc based ones allow large data files to be utilised – up to 40,000 items on a double sided DFS disc. Data may also be fed in from elsewhere using Ascii files. Data manipulation is extensive and can include labelling, sorting, selection of subsets, introduction of function columns, addition of constants, column locking and data display. You may also generate random numbers from 10 different probability distributions.

Descriptive statistics – using commands such as DES, STA and CAL – give the mean, range, percentiles and standard deviation, and may be used to calculate the coefficient of variation, confidence intervals, standard error, skewness, kurtosis and so on. Data may also be checked against a number of probability distributions such as binomial, Poisson, t, F, normal, gamma or Chi.

Tests include goodness of fit, Chi square, Kolmogorov-Smirnov, Mann Whitney and ANOVA. Correlation values – Pearson's – and correlation matrices may be estimated as well as regression values and plots including multiple, weighted or polynomial regression. Analysis may be carried out on columns or rows and can deal with missing values.

Graphical display is by way of histograms, scattergrams, boxplots, needle plots, stem and leaf diagrams and time series graphs. I liked especially the possibility of producing linear regressions with confidence interval curves. PLOt and HIStogram produce high resolution displays, requiring shadow ram memory extension on the BBC B and these may be dumped to a printer via an inbuilt Epson or NEC utility. Sequences of commands may be stored as macro's avoiding the need to retype for each data set.



*Instat: Linear regression*

Although more difficult to operate than the menu-based Unistats, Instat is more flexible and does provide an online Help facility and diagnostic error messages. Recent enhancements provided with the Programmers Guide – £23, manual and disc – include facilities to interact with database files and to add user defined commands to the dictionary.

Instat works on all BBC Micro configurations including shadow ram and second processors (6502, 32016, Z80), DFS and ADFS.

*Product: First*
*Price: £150 (disc)*
*Supplier: Serious Statistical Software*
*Address: Lynwood, Benty Heath Lane, Willaston, S Wirral L64 1SD*
*Tel: 051-327 4268*

FIRST – Fully Interactive Regression STatistics – is more specialised than the packages discussed so far. In particular it concentrates on employing some of the newer and more robust methods for assessing and predicting the association between groups of data, critical data analysis and experimental design. First is therefore unique in micro stats packages – if you need it, buy it.

However, as more non-statisticians such as biologists, health workers and social scientists become more numerate in their approach to scientific data analysis, greater numbers are likely to realise their need for such a package. Nevertheless, First also provides the more traditional statistical analyses such as mean, standard deviation, range, skewness, kurtosis, percentiles, Chi square, t test, up to three-way ANOVA, Mann Whitney, Kruskall-Wallis, and Friedman.

It can handle missing values, transform data, generate random data and locate outliers as well as plot, print, save and load. Upwards of 1500 items may be entered depending on the memory specifications of the micro used. As stated earlier, First's forte is regression analysis and it incorporates multivariate regression with ANOVA and residuals, linear and non-linear curve fitting, weighted and robust regression, cluster analysis, contour plots, diagnostics, time series and autocorrelation.

First is a massive program utilising disc overlays and its format is more in line with Instat than Unistats. Although it is interactive and includes a Help page listing nearly 40 two-character commands, First is not particularly easy to use and I only managed to unleash portions of its phenomenal power. The documentation – more than 80 loose leaf pages – is good, referenced

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> *“As non-statisticians become more numerate in their approach to scientific data analysis, greater numbers are likely to realise their need for such a package”*

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and indexed. Furthermore, free technical advice and support is offered for two years by the author G. R. Edwards.

Although First can operate on a BBC B, B+ or Master, it seems that separate versions are required to make use of shadow ram or second processors – a major disadvantage to portability. Its heavy disc protection also means it cannot be ported to ADFS and hard disc, again you need a separate version. First is also available for the Archimedes.

I tried version 2.76 – BBC Micro – although the program is continuously being revised and the author has recently added a few new routines.

In summary, First is currently most likely to be used by statisticians and find a place in university and industrial applications – for whom approval copies are available on request – although later versions, perhaps with a more user friendly interface, are likely to have wider applications.

## Summing up

The two cheaper packages – Statpack, Statspak – performed well, particularly with respect to statistical descriptors or graphical representation and provide adequate data handling and analysis for the majority of people at good value. They were, however, limited in their range of inferential or predictive statistics, especially those requiring lookup tables, and would not be adequate for an industrial or university research group, for example.

## The bottom line

**There is something here to suit everyone's needs. If you can afford it, Unistat-II is a good buy.**

| PACKAGE | STATPACK | STATSPAK | UNISTAT-2 | INSTAT | FIRST |
|---|---|---|---|---|---|
| **Data handling** | | | | | |
| entry | ●● | ● | ●●●● | ●● | ●● |
| amend | ● | ● | ●●● | ●● | ● |
| transform | | | ●●● | ●● | ● |
| sort | | | ●●● | ●● | ● |
| **Descriptive stats** | | | | | |
| central tendency | ●●● | ●●● | ●●● | ●● | ●●● |
| ranking | ● | ●●● | ●● | ●● | ● |
| distributions | | ● | ●●●● | ●● | ● |
| **Comparative stats** | | | | | |
| parametric | | | ●●●● | ●● | ●●● |
| non-parametric | ● | ● | ●●●● | ●● | ●● |
| **Predictive stats** | | | | | |
| correlation | ● | ●● | ●●●● | ● | ●●●● |
| regression | ● | ●● | ●●● | ●●● | ●●●● |
| **Graphics** | | | | | |
| distribution | ● | ●●● | ● | ●●● | ● |
| association | | ●● | ●●● | ●●● | ● |
| **Ease of use** | ●●● | ●●● | ●●●● | ● | ● |
| **Adaptibility** | ●●●● | ●● | | ●● | |
| **Value for money** | ●●● | ●●● | ●●● | ●●● | ●● |

● limited ●● moderate ●●● good ●●●● excellent

*Summary of facilities*

The more expensive packages obviously offered a more complete combination of these functions. However, I was a little disappointed that less care had been put into some of these than the cheaper versions and there were a number of notable statistical omissions. Unistats-II and Instat were on a par for both price and facilities, the former offering an excellent idiot-proof comprehensive menu-driven package and the latter a more flexible and even more powerful, but more difficult to learn, user-designable macro format.

For powerful regression analysis First obviously goes the whole hog and although excellent has a limited usage for the beginner or casual user.

Overall, my vote goes to Unistat-II for its ease of use and range of facilities although an enhanced and more crashproof version III with inverse regression, confidence limit plots, confidence ellipses, frequency histograms, data distribution checking and user added routines would not go amiss.

However, if you wish to build your own routines, Instat would be better. Ideally a combination of the top of the range statistical programs with a user friendly input and graphical package would suit almost everyone.

I must also add that in a number of these products the software protection restricted program usage and certainly adaptability on different configurations of the BBC Micro – indeed, so much so that there would have been a sixth package in the review, but its disc protection excluded me from using its main statistical routines.

One small gripe is that none of the software attempts to tackle the old problem of *Garbage in, Garbage out*. With the ubiquity of micros, many owners without any formal training in statistical theory – and sometimes without any common sense – can enter data into a micro, press a few keys and produce impressive-looking statistical results to endless decimal places, which may be totally worthless – or even worse, dangerous.

It is my belief that with a little thought the program could check the size of the data group, its distribution type and any unusual values – outliers. It could comment on them and trap the innocent user from carrying out spurious tests and perhaps suggest the appropriate ones.

The nearest approach to tackling problems came from First which provided warning messages. Furthermore, the increased use of linear modelling and Monte Carlo simulation techniques applied to data sets could provide a useful adjunct to the statistical armoury of the data analyser and could perhaps be provided as add-on packs.

In summary, however, we should be very grateful for what we have since producing top-class statistical software, especially for the education and research market, can hardly be considered in terms of commercial viability. Also, imagine going back a mere 10 years and doing those calculations by hand and calculator or on a mainframe in batch mode.

As a footnote, I ought to remind you that access to other, and often very powerful, statistical software can also be gained via MicroLink, or university computer centres for registered users.

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All BBC versions £39.50 (5.25 disk) £41.70 (3.5 disk) Archimedes £79.50 plus VAT (no charge for p & p)

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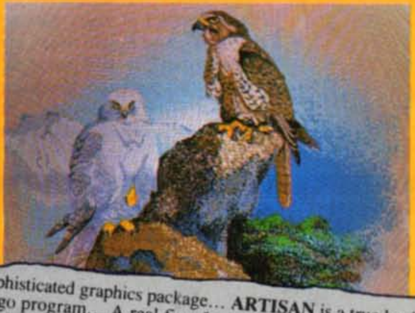

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*ACORN USER February 1988*

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*RISC USER November 1987*

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*ARCHIVE February 1988*

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*A & B December 1987 & January 1988*

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```
*KEY 11 "|! |! |! |! |{sa t
emp|Ms ^-^-^-^-|M|!|U|!|U|!
|U|!|U"
```

*To save the file at any point while you're typing text all you have to do is hold down the Shift and Control keys, briefly press Copy, then release all three. You can then carry on typing if you wish – even while the save is taking place.*

*It works by inserting four Highlight 1 characters into the text. An Escape to command mode occurs and the file is saved under the name* temp. *Then a command to search for and delete the four Highlight 1 characters is issued.*

*The saved file will have the latest set of extra Highlight 1 characters, but as these cancel each other out this is immaterial – they can be reduced to two if you're not using extended highlights.*

*A further benefit of using a highlight code is that there is no unintended word-wrap if they're used at the end of a line.*

*If you don't have View A3.0 you may find it necessary to use one of the red function keys instead of Copy.* – **Lawrence R. Edwards, Hornchurch, Essex.**

## Win a tenner

● **Want to write to The Micro User? The address is: Letters, The Micro User, Europa House, Adlington Park, Adlington, Macclesfield SK10 4NP.**

**Writers of the most interesting letters receive a £10 prize.**

# Teletext on the Z88

*IT is possible to have the full 64-character Teletext graphics set even on an unexpanded Z88.*

*Executing the following short section of code defines an array T$ in such a* way that the statement PRINTT$(n) – where n is betwen 0 and 63 – will print the required character. The graphics are numbered in the standard order, as in Mode 7 on the BBC Micro.

```
 100 DIM T$(63)
 110 FOR N%=0 TO 31
 120 VDU 1,138,61,N%
 130 FOR L%=0 TO14 STEP 2
 140 R%=L% DIV 5*2 : VDU
-56*((N% AND 2^R%)<>0)-7*
((N% AND 2^(R%+1))<>0)
 150 NEXT
 160 T$(N%)=CHR$63+CHR$N%
 170 T$((63-N%)=CHR$82 +T$
(N%)+CHR$1+CHR$82
 180 NEXT
```

*Officially you can only have 16 user-defined characters on the unexpanded Z88, but in fact there is room for 32 – although the top 16 may be lost when you leave Basic.*

*As 64 are needed here, this program exploits the fact that the top 32 teletext graphics are just inverted versions of the others.*

*Lines 120-150 define the Z88 UDCs 0-31 to hold the appropriate shapes and lines 160-170 set up the array so that* T$(0) *to* T$(31) *contain the VDU codes to print them and* T$(32) *to* T$(63) *contain the codes to print the same shapes in inverse video in reverse order.*

*You can use this method on an expanded machine to have the full teletext character set plus another 32 graphics characters of your choice* – **T.D. Lascelles, Portsmouth.**

# Stripper revamped

*IN your August 1988 edition you published a relocatable module program for the Archimedes by Neil Strong which stopped control characters being sent to the printer.*

*It works fine apart from one serious problem – it cannot handle the RMTidy command.*

*On issuing this nothing appears to go wrong but the module no longer stops control characters. This failure can be clarified by issuing a second RMTidy which produces a* Bad vector release *error message.*

*When an RMTidy is executed the module is temporarily disabled by the operating system calling its finalisation code. This should release any vectors claimed although it can retain its workspace if the call is non-fatal.*

*When the operating system finishes tidying the RMA it calls the initialisation code of the module, which should then reclaim any vectors that were released.*

*Neil's Strip Control doesn't do this. Instead the initialisation code checks to see if it has been already called to set up the system variables and vectors and, if it has, terminates without doing anything, so the vectors are not grabbed the second time.*

*The result is a module which thinks it has claimed a place in the printer vector's queue when it hasn't. The error occurs when you give a second RMTidy because the module tries to release a vector which it doesn't have.*

*This fault is very simple to cure and only requires moving four lines of code – the vector claiming part of the initialisation routine.*

*These lines should be placed before the three which check if the initialisation code has already been called. You therefore need to move lines 320 to 350 to in between lines 280 and 290.*

*With these changes, I have found that the program behaves correctly for all module commands and is now compatible with other software that tidies the module area.* – **George Taylor, Cambusland, Glasgow.**

# Thriving Down Under

*I AM the secretary of the Auckland BBC User Group, ABUG. We have been established for some years now and would like it to be known that we are a thriving club using Compacts, BBC Bs, Masters and Archimedes. There is a user base of about 40,000 machines in New Zealand.*

*Thank you for your excellent magazine, which all of our members eagerly await each month.* – **Theo Olifiers, ABUG, P.O. Box 9322, New Market, Auckland, New Zealand.**

**£10 Prize letter**

# Multiple prints

*I HAVE a reliable old BBC B which I regularly use to write newsletters for clubs and societies using View.*

*Can you tell me how to print multiple copies – say 30 – of any file so I can greatly speed up the printing process? Currently I do them one at a time*

Turn to Page 130 ▶

◀ *From Page 129*

*by re-entering instructions.* – **M.J. Stickland, Pontypool, Gwent.**

● Assuming you always print complete pages, the simplest method is to set up a function key:

```
*K.0. PRINT¦M
```

Then repeatedly press this for the number of copies you want – the keyboard buffer will save up to 31 key presses.

Alternatively, you could change your word processor. Mini Office II and Inter-Word offer multiple copies as standard, and on Wordwise-Plus you can write a segment program to give you the feature.

## Problems en masse

*LIKE most of your readers I have been impressed by the convenience and flexibility of my Z88. I no longer have to hog a TV set or sit in another room while I write letters like this.*

*I also have a few eprom cards for storage of essential information, but they are too expensive to use for longer term bulk storage – a need which would normally be met by disc or tape. Unfortunately, I do not always have easy acccess to a BBC Micro to which I could transfer data and programs. Does Cambridge Computer or a third party plan to produce a disc drive?*

*And what is the edge connector for concealed beneath the cover below Enter on the right hand side of the Z88?*

*It really is a shame to see such a brilliantly designed micro without cheap bulk storage. It could easily be a world-beater.*

*But who would really want to fork out £20 every time you need another 32k of permanent storage?* – **G.R.Williams, Cheltenham, Gloucestershire.**

● The slot at the back is not for extension and to our knowledge Cambridge Computer does not intend to provide any other mass storage.

## The price on your head

*I HAVE a two year old Juki 5500 printer which cost me about £200. Recently I have had problems with the print head so I decided to replace it, but when I phoned a Juki agent I was quoted £198 for a replacement.*

*The company said the high cost is due to shipping charges, but a new printer only costs about £280. If some other make of print head will not adapt I will buy a new printer – but it will definitely not be a Juki.* – **J. Parsons, Peterlee, Co. Durham.**

● Unfortunately, this is a problem that exists with several makes of printer and not just Juki.

When you buy a new head – or any other component – the benefit of the competition between suppliers holding the price down is not as great as on the complete unit. However it is still worth shopping around for the best price.

## Dump Out difficulties

*AFTER the interesting articles in your August 1988 issue I bought DumpOut 3, but it leaves gaps between the lines when I print graphics with my Brother M1009 printer.*

*I've tried toggling the line feed DIP switch manually, as well as using *FX6,0 and *FX6,10 commands, but to no avail. What is the remedy please?* – **D.A. Patterson, Chorley, Lancs.**

● The slight gap indicates that the line spacing has not being defined correctly – although Dump Out 3 will issue the correct codes any incompatible printer won't accept the command. It may be necessary for you to send a line spacing command before starting the dump.

## Easy Dos it

*I'VE had the Dos-plus boot disc for my Master 512 modified by Programmable Systems Design to provide the numeric keypad facility which enables the BBC B to access the IBM keys necessary for certain software applications.*

*When I tried out the modified disc I encountered some difficulty in making a back-up copy and rang PSD for advice. My call was taken by Ken Fullbrook who rang me back later that evening to discuss the situation.*

*Although it was quickly established that the fault was not caused by his modification, he spent over half an hour on the phone establishing exactly what was wrong. To meet this kind of courtesy and consideration following such a modest financial outlay is worthy of mention and commendation.* – **Rex Conway Crapp, Carmarthen, Dyfed.**

## With a View to some £s

*I HAVE recently bought a Master with the View word processor. Unfortunately the pound sign comes out as an apostrophe. Any advice would be appreciated.* – **Tom Phythian, Brandlesholme, Bury.**

● You can use the routine from Letters in our January 1989 issue, entitled *Minimalists strike*. Prepare the routine and save it on disc, enter View and type *RUN KODE. Now issue:

```
*CODE 96 35
```

When code 96 is printed it is converted to Ascii value 35 which should print as £.

## Listing files

*I RECENTLY bought a printer and immediately typed in File Lister from the November 1987 issue of* The Micro User. *It works very well except for one small point: It apparently does not cater for coloured REMs and I can't work out how to make it do this.*

*I use them in most of my programs, so any assistance would be much appreciated.* – **R. Hunt, Uxbridge, Middx.**

● The program changes are quite simple:

```
745 rem%=FALSE
815 IF byte%<>13 IF rem
% line$=line$+"<"+STR$b
yte%+">":ENDPROC
855 IF byte%=&F4 rem%=T
RUE
```

This will ensure all colour codes in REMs are printed as their number values.

**ALL programs printed in this magazine are exact reproduction of listings taken from running programs which have been thoroughly tested.**

**However, on the rare occasions when mistakes occur corrections are published as a matter of urgency. Should you encounter error messages when you type in a program, they will almost certainly be the result of your own typing mistakes.**

**Unfortunately we can no longer answer personal programming queries concerning these mistakes. Of course letters about suggested errors will be investigated without delay, but any replies found necessary will only appear in the letters pages.**

## Recursive Arm power

*WRITING recursive procedures in machine code has always been problematic. But with the Arm chip you can produce quite startlingly simple and elegant code. As an example here's the classic factorial calculator:*

```
REM > Factorials
sp=13:link=14:DIM M%40
FOR I%=0TO2STEP2:P%=M%
[OPTI%
 MOV   r1,#1
.fact
 STMFD (sp)!,{r0,link}
 CMP   r0,#1
 SUBGT r0,r0,#1
 BLGT  fact
 LDMFD (sp)!,{r0,link}
 MUL   r1,r0,r1
 STR   r1,ans
 MOV   pc,link
.ans   EQUD 0:]:NEXT
REPEAT
INPUT"Factorial",A%
CALLM%:PRINT!ans
UNTIL FALSE
```

*It will not calculate very large factorials because the MUL command will only operate up to 32 bits of accuracy, and results greater than this will be meaningless.*

*The routine also shows how much can be achieved with so little – it's only nine instructions long.* – **Dr. Anton L. Mans, Fraserburg, South Africa.**

## New ribbons for old, again

*IF you examine a used printer ribbon you find that only one small strip along its length has been used.*

*The ink is usually soluble in methylated spirits or even WD40. If you remove the cover and soak the old ribbon in the solvent you can rejuvenate it quite remarkably.* – **Mr. A.N.R. Campbell, Bristol.**

## Crashing asterisks

*I have a query about machine code – I am a rank novice at the moment but I'm trying to learn. I have written a short program that will print an asterisk every time A is pressed – but each time I try to run it it crashes.*

```
 10 P%=&1900
 20 FOR I%=0 TO 2 STEP 2
 30 [OPT I%
 40 .loop
 50  JSR &FFE0
 60  CMP #65
 70  BEQ print
 80  JMP loop
 90 .print
100  LDA #42
110  JSR &FFEE
120  JSR loop
130 ]:NEXT
140 CALL &1900
```

*Can you help?* – **Alex Hunsley, Fenham, Newcastle upon Tyne.**

● The reason your program hangs up is both the most obscure problem we usually come across yet the easiest to solve.

Quite simply, the program is probably sitting at &1900 in memory and you are asking Basic to put the machine code in the same place. The first pass will run correctly, but the second will fail, so you must set aside an area of memory for assembly. Do this by inserting or replacing the following lines in your code:

```
  5 DIM M% 256
 10 P%=M%
 20 FOR I%=0 TO 2 STEP 2
140 CALL M%
```

However, the first three lines highlight the second problem. Because code is assembled in two passes you must reset *P%* at the start of the second loop, so lines 10 and 20 should be the other way round:

```
10 FOR I%=0 TO 2 STEP 2
20 P%=M%
```

Finally, at line 120 you use a *JSR loop* to restart the loop. This will seem to work, but each command puts another two bytes on the stack, which is only 256 bytes long. When the stack is full it wraps around to the start again and will begin to delete important data regarding the return to Basic.

There's no return in this program anyway, but in other situations it could be serious. Just change the JSR to JMP.

That handles the errors, but the routine can itself be made shorter and simpler by changing these lines:

```
60  CMP #65
70  BNE loop
```

and deleting lines 80 and 90.

## Welcome art bonus

*ALTHOUGH Quest Paint is an excellent package it does not have any really good fonts on the supplied disc. If you have a Master you'll find that the Welcome disc has three files called Thin, 7by8 and Italic.*

*Before entering Quest Paint type one of the following:*

```
*Thin
*7by8
*Italic
```

*This will load the font which will then be used by the package as font 1 – the system one. For best results you should use them with* Lock size *on.* – **Andrew Thacker, Croydon, Surrey.**

## Enigmatic errors

*I HAVE typed in the Enigma variations listing from the July 1988 issue of* The Micro User *and checked my typing against the checksums – they indicate that I have made no errors.*

*But when I run the program and try to load a piece of code to decode from disc, I get the error BAD DIM at line 780.*

*However, if I type the code in direct the program seems to work OK – the problems start when I try to use pre-typed code from disc.*

*I am assuming that the file to be loaded can be created by using Wordwise and saving with the name message.* – **B.J. Mahony, Marden, Hereford.**

● Unfortunately it's that assumption that's causing the problem: The pre-typed file needs to be in a special format. You can use the following program to create the correct file from the Ascii – spooled – one from any word processor:

```
10 Z%=OPENIN"code"
20 L%=EXT#Z%
30 Q%=OPENOUT"code2"
40 PRINT#Q%,L%
50 FOR I%=1 TO L%
60 BPUT#Q%,BGET#Z%
70 NEXT:CLOSE#Q%
80 CLOSE#Z%
```

## DFS doesn't play the game

*I HAVE a BBC B fitted with a Solidisk 40/80 drive and 2.2J DFS plus Wordwise, WordAid and WordAid Plus.*

*I bought three Superior Software games – Elixir, Pipeline and Play It Again Sam 2 – but none of them will run. I've tried them on another BBC B with Acorn DFS and a Cumana drive and they work perfectly.*

*Could the Wordwise or the WordAid chips be affecting the games or is there an incompatibility problem?* – **Mr. G. Bright, Chelmsford, Essex.**

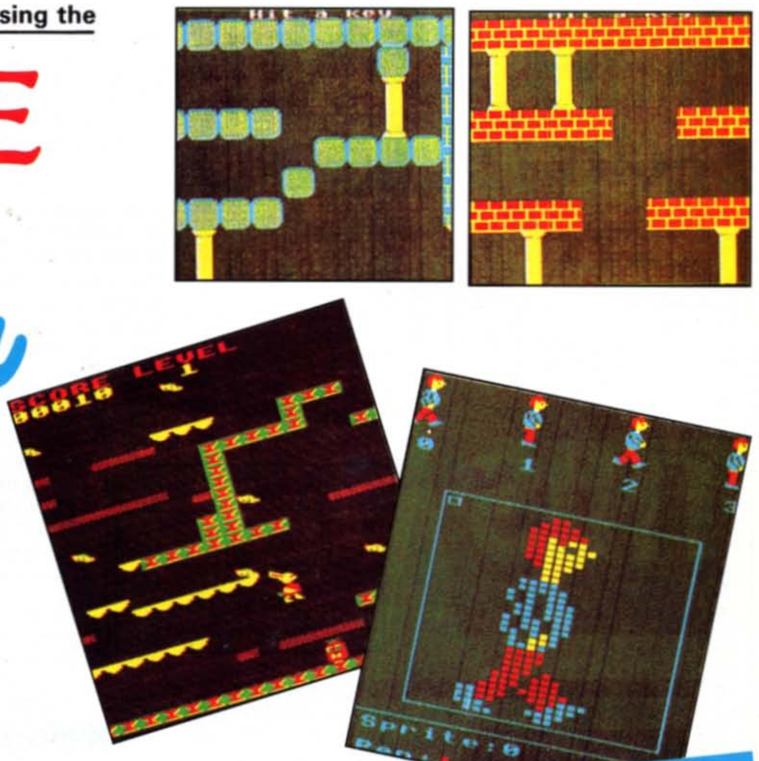
● Although the WordAid chips could be a problem – it certainly isn't Wordwise – the most likely culprit is the Solidisk DFS. Unfortunately this software is very non-standard and upsets a lot of games' protection.

If you want to play games you will have to change your DFS – it probably won't be necessary to exchange your disc drive as these are merely labelled by the retailer or supplier.

The Watford DFSs are all satisfactory – they don't interfere with games – and provide many facilities beyond the Acorn DFS.

**Write your own arcade smashes using the**

# ARCADE GAME Creator



Screens designed using Arcade Game Creator

**Arcade Game Creator is a suite of programs for the BBC Micro or Electron. Taken from the pages of *Electron User,* it lets you into the secrets of writing fast-action arcade games, and provides you with a number of utilities to make design and programming easier.**

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**If you are an aspiring games programmer, this is an offer you simply cannot afford to miss!**

## Arcade Game Creator

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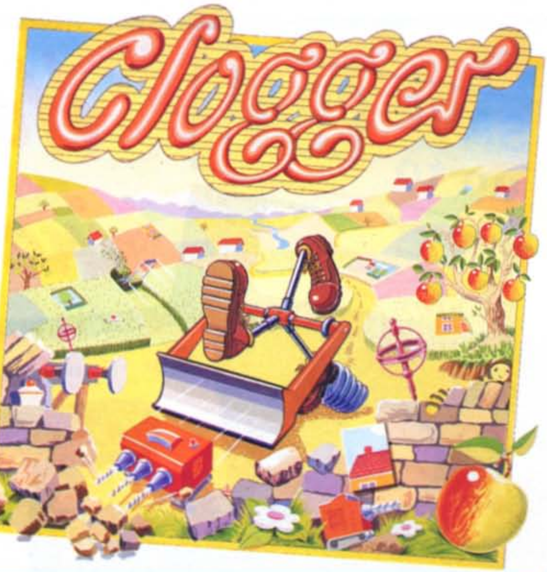

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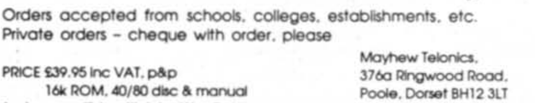

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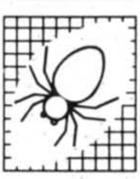

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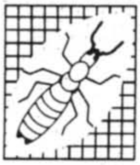

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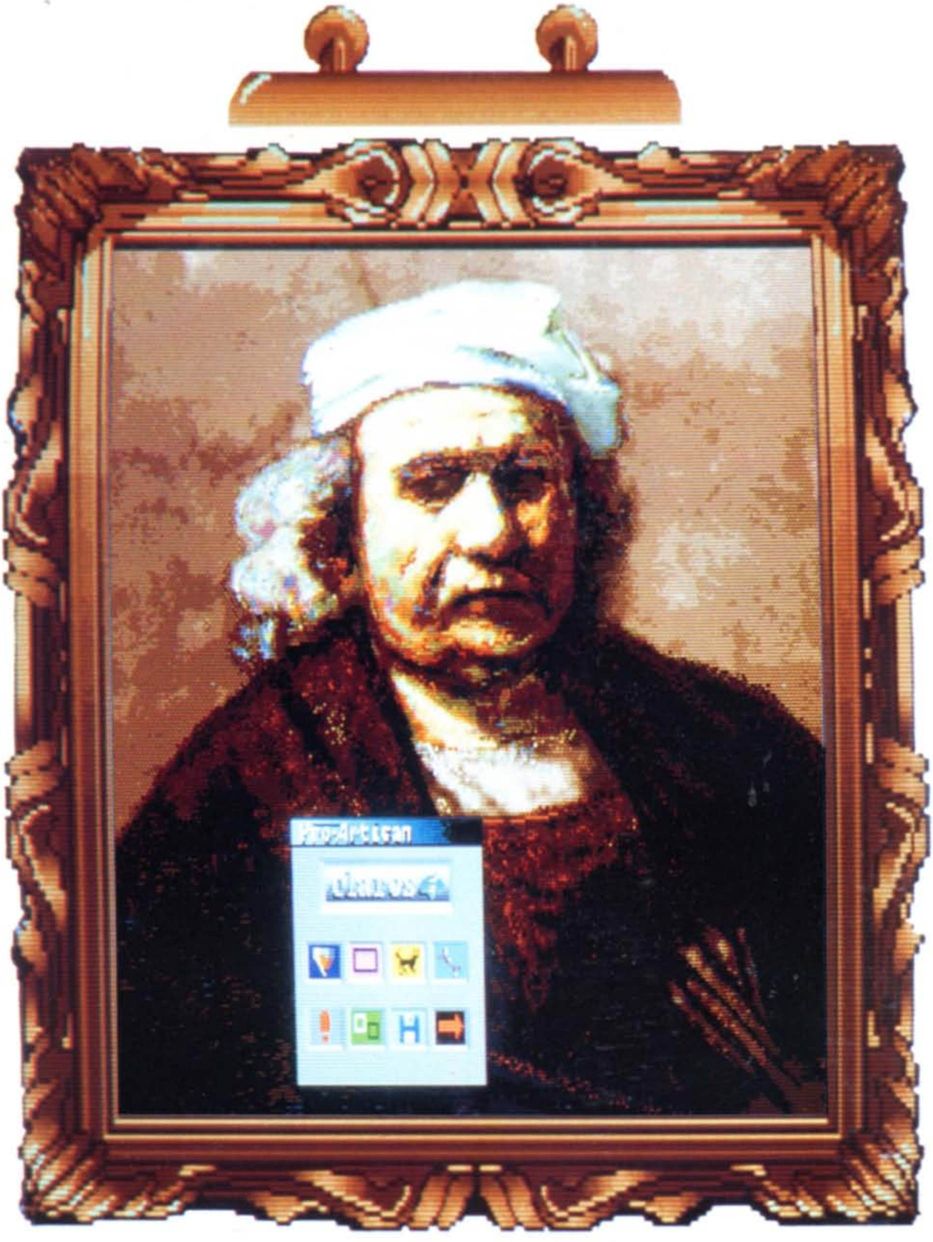

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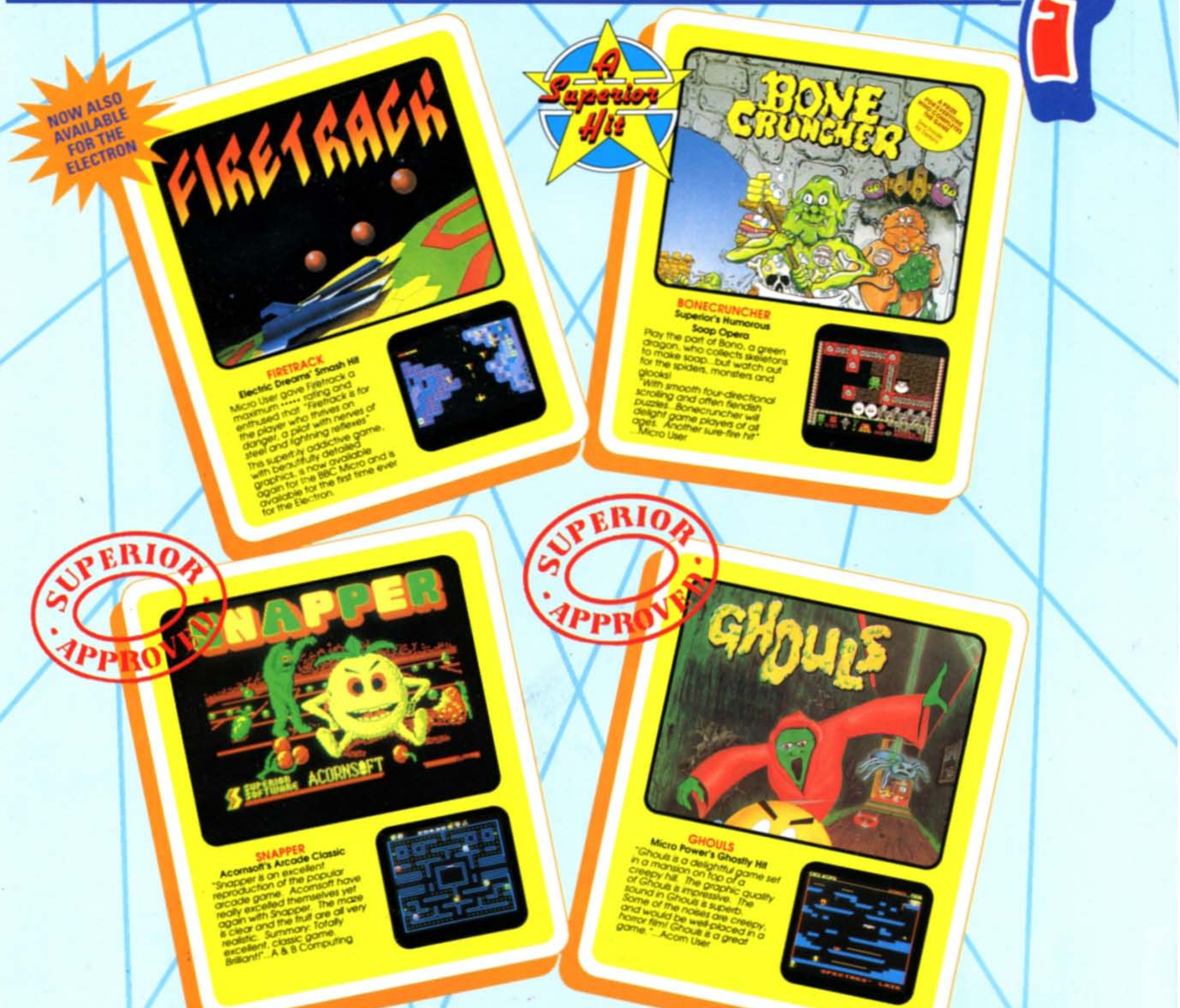

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